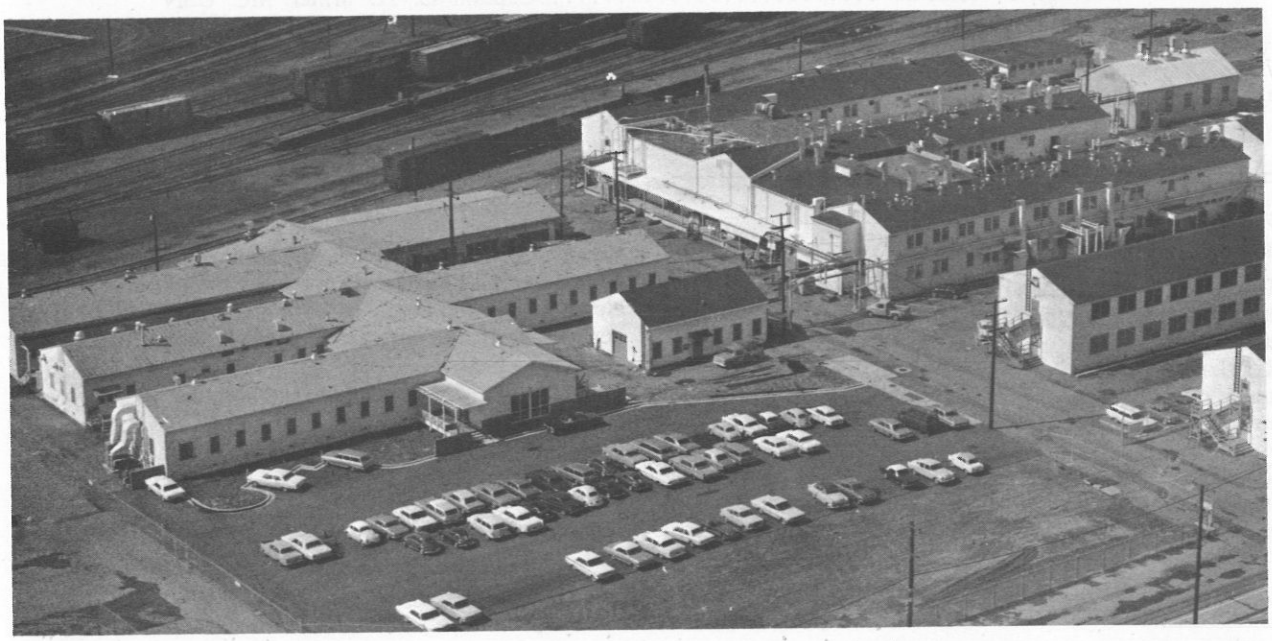
NAVMED P-5088

UNITED STATES NAVY Medical News Letter

Vol. 51 Friday, 8 March 1968 No. 5



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Policy

The U.S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article, in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

Change of Address

Please forward changes of address for the News Letter to Editor: Bureau of Medicine and Surgery, Department of the Navy, Washington, D.C. 20390 (Code 18), giving full name, rank, corps, old and new addresses, and zip code.

FRONT COVER: NAVAL MEDICAL RESEARCH UNIT NUMBER ONE. This research facility located on the University of California campus at Berkeley was established in 1934, and, except for several months in 1943, has been active ever since. Its mission is to conduct research in biomedical sciences, gather information on military medical problems, study communicable diseases that are endemic or epidemic to different world areas, and to conduct training in research techniques. Studies are made in the fields of virology, aerobiology, bacteriology, mycology, epidemiology, ecology, biophysics and engineering. Although the prime interest is in airborne infectious diseases, NAMRU–1 has also made progress in the field of laboratory equipment. It has developed miniature disposable tissue culture tubes, devised protective clothes, such as hoods, for use in studying contaminated environments, and created equipment which allows the safe study of virulent organisms. The Unit discovered a capillary agglutination test for detection of tularemic antibodies, a method which is simple and requires only minute quantities of serum to be used. Among the other contributions to medicine have been these: detection of tubercle bacilli in mouthwash specimens by the use of membrane filter cultures; discovery of the physiological stresses resulting from cold weather operations, and the effect of air ions on the trachea of primates; and the recovery of aerosolized bacteria from humans. Recently NAMRU-1 has studied the control and prevention of meningococcal infection in order to protect personnel better and improve treatment. This study emphasizes advanced methods of identifying the infection and protecting susceptible individuals, stresses control of the infectious organism's spread by eliminating the carrier state in the human, and seeks to prevent individual illness by effective immunization. NAMRU-1's research into communicable and airborne diseases over the past 34 years has produced important contributions to both military and civilian medicine.

The issuance of this publication approved by the Secretary of the Navy on 4 May 1964.

ORGANIZATION AND LOGISTIC FRAMEWORK OF THE SHOCK STUDY PROGRAM

STATION HOSPITAL—NAVAL SUPPORT ACTIVITY, DANANG, VIETNAM

LCDR Larry C. Carey, MC USNR, LT Charles T. Cloutier, MC USN, and LT Brian D. Lowery, MC USNR.

Introduction

January 1966, heralded the inauguration of the Navy's Frozen Blood Feasability Study at the Station Hospital, Naval Support Activity, DaNang, Vietnam, and at other in-country naval facilities. It soon became evident that the casualties of this conflict presented more questions to be answered, than simply whether or not frozen blood was a suitable resuscitation product.

The nature of the current conflict, in which the United States is involved in Vietnam, has presented the physicians responsible for the care of combat casualties, the challenge of, and responsibility for, taking care of a type of casualty not seen in large numbers in previous wars. Due to rapid helicopter evacuation to definitive and total care facilities, patients with massive, multi-system trauma are frequently seen and treated within the hour of their wounding. Many of this group would have expired before treatment with a less efficient medical evacuation system.

There have been in previous wars a group of casualties in the triage system of treatment who were set aside because of the multiplicity and massive nature of their wounds. The great effort, involving both men and material, required to salvage these patients would have detracted materially from the numbers of patients with lesser wounds who could be treated more rapidly and with more reasonable hope of success. These latter patients could then be returned to duty after short term recovery, or put into the routine evacuation system to zone hospitals or the continental United States. This principle of selective abandonment ceases to exist. We have not seen a patient to whom could not be devoted fullest attention and support for definitive care, despite the number of casualties being treated at a given moment.

It is important to note here other differences in the logistics and tactics of this war as compared to the Korean and European wars, and even the large division sweeps of the Pacific Islands in World War II. There are no relatively fixed lines of battle which may advance or retreat with uniformity. In the northern sector of this country, which this hospital supports, there are individual battalions interspersed, often at wide intervals, and responsible for circumscribed areas with 360° perimeters. Thus frequent patrol action away from the confines and safety of the battalion post is a necessity. In addition to large combat confrontation, there constantly exists the threat of enemy anti-personnel devices (e.g. booby traps, land mines, grenades, small-arms sniper fire) which have become so prevalent in this conflict. This too has resulted in a greater number of casualties arriving at the hospital with multiple trauma and multi-system injuries than in previous wars.

One of the problems in studying shock is the availability of a homogenous group of patients. There is increasing evidence that patients in shock from hemorrhage, sepsis, coronary occlusion or burns are not indeed comparable. The establishment of a facility to study shock in depth in battle casualties has obvious advantages. The location of evacuation type hospitals near combat zones has not always been possible. Again the importance of helicopter evacuation must be emphasized. The large multi specialty hospital has become in large part the first stop in the chain of evacuation. Fresh, untreated casualties are now seen in large number at a definitive care center. The present shock study team at the U.S. Navy Station Hospital, DaNang, RVN, takes advantage of that situation.

It is our intention to provide a series of continuing reports on the activities of the shock program, not only to disseminate the results of our findings to other physicians, but hopefully to stimulate criti-

cal comments from them. This first report then will detail the organizational and logistical framework of the Shock Unit. Subsequent reports will deal with areas under study and our investigative findings.

Personnel

There are 11 members assigned full time to the shock team. Included are 3 physicians attached to the department of General Surgery. The head of the team is board certified in General Surgery (LCDR Larry C. Carey, MC USNR) and 2 (LT Brian D. Lowery, MC USNR and LT Charles T. Cloutier, MC USN) have each completed 1 year of general surgery residency.

The laboratory staff consists of 4 technicians, headed by a Chief Petty Officer (John J. Horton, HMC USN) who has had considerable experience in laboratory techniques and management procedures. The actual bedside patient care is provided by 4 hospital corpsmen assigned to the shock unit, and who have been trained in data collecting methods so imperative to this type of clinical research. In addition to our full time personnel, supplementary support is provided at varying intervals by physicians from the various other departments at the hospital, and from the NAMRU–2 in Taipei.

The logistical support required to maintain a study such as this is demanding. This has been amply provided by the Naval Medical Research Institute, Bethesda, Maryland, by the Clinical Investigative Center, Oakland, California, by the Naval Medical Research Unit–2 Taipei, Formosa, and by the Frozen Blood Laboratory, United States Naval Hospital, Chelsea, Massachusetts. The commanding officers of these various establishments have been most generous in their support of our activities.

Physical Plant and Equipment

Since July 1, 1967, laboratory space has been generously provided by the NAMRU–2 Detachment at the hospital. Under construction, and soon to be completed, is a full quonset hut which will be devoted exclusively to surgical research activities. A M.U.S.T. Unit (Medical Unit-Self Contained Transportable) has been utilized as a resuscitation unit. This is a movable operating room, adequately equipped for its specialized function of shock resuscitation. The unit is air-conditioned, has a constant voltage electrical supply, and houses some of the equipment used in the study. On admission the shock patients are removed from the general triage area to this unit. Following resuscitation, and stabilization, they undergo their necessary surgery by the various specialists as their wounds indicate. They are then transferred to the Intensive Care Unit, where 4 beds are provided for the use of the shock team. Post-operative care is a joint venture between the shock team personnel and the surgical specialties involved.

Despite its location in an active war zone, the laboratory equipment ranks with the best available in many institutions in the United States. We have the equipment available to perform the full spectrum of chemical and physical measurements that our studies require. In addition to the routine equipment needed for hemogram, urogram, and serum electrolyte determinations, specialized instrumentation is available to perform blood gas analyses, to determine cardiac output, blood volume and body space measurements. A respiratory analog computer for evaluating respiratory function, a 2 channel Sanborn strip recorder, a Fisk osmometer, and a Beckman oximeter, are also available.

Resuscitation and Sampling Techniques

Early in discussions of proposed protocols, it was established that at no time would accepted patient care be compromised by research efforts. We have steadfastly adhered to this principle in all studies.

At the time of our arrival in Vietnam, the standard resuscitation regimen at Station Hospital for casualties in shock, was lactated Ringer's solution given in large volume, whole blood, usually cross-matched, $NaHCO_3$ and Mannitol. $NaHCO_3$ was usually given on an emperical basis without knowledge of arterial pH. Mannitol was being given very early during resuscitation. This regimen had been obviously successful and it was not our intent to alter it until objective data would support such alteration, except for staying the administration of Mannitol until adequate fluid load had been given.

The plan of resuscitation is as follows. The casualty is met at the receiving area by one of the shock unit corpsmen who maintain constant helicopter surveillance. Resuscitation is directed by the shock unit physicians. Airway is assured, hemostasis obtained and intravenous fluids started, as with all seriously injured patients.

Because of the inherent body chemistry abnormalities resulting from central nervous system and penetrating chest injuries, we have limited our study patients to those with massive extremity and abdominal wounds. This is not to say that we have ignored these other patients arriving in shock.

Quite to the contrary; the physicians and laboratory are actively involved in the care and support of these patients, but we initially, have not considered them in the same detail as those with altered physiology resulting from acute blood loss and massive soft tissue damage alone.

At the time of resuscitation one, and often two, central venous catheters are inserted in the subclavian veins. Not only are we able to rapidly replace large volumes of fluids via this route, but we also have a constant monitoring of the central venous pressure, and a readily available route for venous sampling. A peripheral artery sample is obtained and sent for immediate analysis of pH and blood gases. Results are returned within 10–15 minutes, and NaHCO3 is then given only if there is significant acidosis. A Foley catheter is inserted and the bladder contents collected for subsequent analysis.

From the time of arrival, and for as long as the patient remains on the study, there is time related recording of all intake and output. Monitoring and sampling times are as follows: admission to surgery, during surgery, 1st 24 hours post-operatively in 6 hours segments, then daily divisions beginning and ending at 0800. Arterial pH and blood gas analyses are repeated as often as necessary before, during and after surgery, and whenever indicated, e.g., severe acidosis being treated.

Analyses performed are peripheral arterial Hct, pH, pO_2, pCO_2, HCO_3 and % O_2 saturation computed from standard homograms. Blood lactate and pyruvate levels are determined on arterial samples. Venous blood is obtained for lipase, total protein, albumin, glucose, creatinine, bilirubin, osmolality and plasma hemoglobin content. Urine is analyzed for fat content, specific gravity, osmolality, Na, K, C1, creatinine, hemoglobin, reducing substance and titratable acidity. Where applicable, the gastric aspirate is analyzed for its electrolyte content.

Studies To Date

Initial efforts were directed at obtaining base-line and control data for later comparison with battle casualties. Twenty previously healthy combat marines were evaluated on their return from a 7 day field patrol. During that time they subsisted exclusively on standard C-rations, and lived without shelter in an environment in which the ambient temperature was in excess of 100° F during the daylight hours. To see if this combat activity had altered their blood chemistry in any measurable degree from the normal range, in the parameters chosen for study, comparable studies were carried out on 20 young hospital corpsmen and physicians. The latter lived in a fixed facility with unlimited food and water and air-conditioned working areas.

Twenty-three patients were then evaluated who arrived in shock, and who were resuscitated with lactated Ringer's solution and crossmatched whole blood. Next, 20 patients were similarly evaluated using normal saline and crossmatched whole blood as the resuscitation regimen. A similar, but smaller group will then be resuscitated employing plasma and whole blood.

Cardiac output, blood volume, and selected body space measurements are being obtained on patients from all 3 groups. Concomitant studies are being carried out to evaluate endocrine disturbances, fat embolism, respiratory function, bacteriologic flora of the wounds, efficacy of various route lactate samplings and subclavian percutaneous catheter techniques.

Summary

An outline of the organizational and logistical framework of the shock study program at the Station Hospital, NSA, DaNang, has been presented. In 6 months of operation, evidence has been uncovered which is contrary to the previously accepted ideas of physiologic abnormalities occurring in hemorrhagic shock. This has enabled us to improve the care of casualties in the I Corps area in Vietnam, and is information which hopefully will stimulate further studies on blood loss shock, and eventually lead to more effective management of blood loss shock in all populations.

THE CAST SYNDROME—CASE REPORT

J. Phillip Nelson, MD, Deward O. Ferris, MD, and John C. Ivins, MD, Mayo Clinic and Mayo Foundation, Rochester, Minnesota, Postgrad Med 42(6):457–461, December 1967.

The cast syndrome is characterized by prolonged nausea and vomiting secondary to gastric and duodenal dilatation. The obstruction is caused by extrinsic pressure from the superior mesenteric artery. Duodenojejunostomy after removal of the body cast corrected the obstruction in the case reported.

Plaster of paris body casts continue to have wide application in the field of orthopedic surgery. Certain complications are inherent in the use of any such body mold. Among these are undue local pressure and excessive generalized constriction.

Another complication arising from the use of the body cast is the cast syndrome. This term, coined by Dorph in 1950, refers to prolonged nausea and repeated vomiting secondary to gastric and duodenal dilatation in patients wearing a body cast. Although gastric dilatation may have numerous causes, the pathogenesis in the cast syndrome clearly seems to be mechanical compression of the fourth portion of the duodenum by the superior mesenteric artery. If such obstruction is allowed to continue without intervention, severe hypokalemic alkalosis, hypovolemia and finally death will result. Thirteen documented case reports of this syndrome have been recorded in the literature and summarized by Thompson and by Schwartz and Wirka.

The following case report is presented to reemphasize the need for continued awareness of this complication to the use of the body cast, to record the dramatic beneficial results obtained from surgical duodenal decompression, and to call attention to the interesting arterial anatomic variant encountered at operation.

Case Report

A 15 year old boy was hospitalized April 26, 1960, one month after the onset of severe, unremitting low back pain and low-grade fever that followed an upper respiratory tract infection. The past medical history was noncontributory except for nonspecific infantile feeding problems.

Examination revealed marked tenderness and muscular spasm of the right lumbar region. The erythrocyte sedimentation rate was 60 mm in one hour by the Westergren method, and the leukocyte count was 13,600 per cubic millimeter. A roentgenogram of the lumbar spine showed a destructive process in the right superior aspect of the third lumbar vertebra. Intraspinal inflammatory disease was diagnosed.

Subsequent open biopsy of this region revealed granulation tissue with no gross purulence. *Staphylococcus aureus* was cultured from the tissue. Penicillin was administered; the wound healed primarily, and the back pain subsided rapidly. Nine days after operation a body cast extending from the xiphoid process to the os pubis was applied with the patient in a standing position. He was feeling much improved at the time of his discharge from the hospital.

Two days after discharge the patient returned to the hospital emergency room. He complained of nausea and of vomiting five times after meals. An anterior window was cut in the cast, and examination revealed active bowel sounds and no distention. The patient was given an antiemetic and dismissed.

Two days later he again returned because of persistent nausea, vomiting and vague abdominal pain. He had passed flatus, and examination through the cast window again showed active bowel sounds with no distention or peristaltic rushes. No gross clinical signs of fluid and electrolyte depletion were present, and serum electrolytes were normal. A roentgenogram of the stomach was interpreted as being normal. Because of the patient's previous instability of personality and because there was some evidence that the vomiting was self-induced, psychiatric consultation was obtained. No specific psychodynamic causes were elicited and no recommendations were made. However, when the patient was given the alternative of continuing the vomiting and going to the closed psychiatric ward or stopping the vomiting and going home, he ceased the vomiting for several days and was discharged from the hospital.

Nonetheless, intermittent episodes of nausea and vomiting continued to occur every few days, and six weeks after the cast was applied these episodes again became unrelenting. On one occasion diffuse upper abdominal pain and hematemesis also occurred. The patient was again admitted to the

hospital, and a flat plate of the abdomen showed marked gastric dilatation. A roentgenogram of the stomach showed great enlargement of the stomach and the first three portions of the duodenum. Superior mesenteric artery syndrome with intestinal obstruction at the ligament of Treitz was diagnosed. Several days after gastric suction and fluid and electrolyte replenishment were instituted, the cast was removed and the patient's abdomen was explored. The stomach and duodenum were found to be dilated to about three times their normal size, whereas the jejunum and ileum were normal in size and appearance. The obstruction was located at the duodenojejunal juncture, and the superior mesenteric artery was found to cross this area anteriorly. Furthermore, the ileocolic and right colic arteries were found to have anomalously high origins from the mesenteric artery so that they also crossed anteriorly over the duodenojejunal juncture.

Duodenojejunostomy was therefore carried out. The patient's postoperative course was uneventful, and when he was discharged from the hospital seven days after operation he was ambulatory and free of back pain and was eating an unrestricted diet. Five and one-half years later the patient reported that he was leading an unrestricted life and that he had had no difficulties with either his digestive system or lumbar spine in that interval.

Discussion

Of the 14 cases of the cast syndrome (including the present one), 13 were in persons between the ages of 12 and 22 years. It is probable that the body cast causes prolonged and constant hyperextension of the lumbar portion of the spinal column. This hyperextension is particularly marked in younger patients, who have a more mobile spine. Lumbar spinal hyperextension may result in elevation of the origin of the mesenteric artery, therefore lessening the angle between the mesenteric artery and the aorta and increasing the pressure on the fourth portion of the interposed duodenum. Furthermore, when the patient is in a position of spinal hyperextension, the small bowel is more likely to fall into the pelvis and thereby increase traction on the mesenteric artery. The likelihood of significant obstruction is further increased if multiple vessels cross the duodenum, as in the reported case.

This case illustrates several interesting points. The obstruction was certainly intermittent in nature for several weeks, since the patient had some voluntary control over his vomiting. One roentgenogram of the stomach did not demonstrate any gastric or duodenal dilatation, and severe electrolyte imbalance did not develop. Windowing the cast had no effect on the progression of the obstruction. Total obstruction probably occurred when the edematous duodenum became so dilated that it could no longer propel its contents into the jejunum. Finally, adequate decompressive intestinal anastomosis plus removal of the cast resulted in complete, long-term symptomatic relief of the obstruction.

Summary

The cast syndrome is characterized by prolonged nausea and vomiting secondary to gastric and duodenal dilatation occurring in patients wearing a body cast. Extrinsic pressure from the superior mesenteric artery causes obstruction of the intestine at the level of the ligament of Treitz. A clinical case history of this entity and its treatment by decompressive duodenojejunostomy has been presented in the hope that more widespread awareness will stimulate earlier recognition.

(The omitted figures and references may be seen in the original article.)

NEPHROTOXICITY OF ANTIBIOTICS

Calvin M. Kunin, MD, JAMA 202(3):204–208, October 16,1967.

The potentially nephrotoxic antibiotics in current clinical use are neomycin, kanamycin, paromomycin, bacitracin, the polymyxins (polymyxin B, and colistin), and amphotericin B. Nephrotoxicity was reported with early lots of streptomycin, but the drug now commercially available does not appear to have this property. Fortunately, the nephrotoxicity of each of these drugs appears to be reversible provided their administration is stopped soon enough. Patients with underlying renal disease ap-

From the departments of preventive medicine and medicine, University of Virginia School of Medicine, Charlottesville.

This communication was invited by the Section on Adverse Reactions of the Council on Drugs.

Reprint requests to Secretary, Council on Drugs, American Medical Association, 535 N Dearborn St., Chicago 60610.

pear to be particularly sensitive to most of these agents. This sensitivity may be attributable in part to the tendency of these drugs to accumulate rapidly in the blood of uremic patients given ordinary therapeutic doses and in part to the diminished renal functional reserve of uremic patients. Tetracycline may now be added to the group of potentially nephrotoxic drugs, because a reversible Fanconi-like syndrome produced by preparations containing degraded tetracycline has been observed.

Tetracyclines.—A primary renal toxic effect of undegraded tetracyclines has not been demonstrated in man. However, an elevation of the blood urea nitrogen is observed in patients, particularly those with renal failure, receiving these antibiotics. Apparently this effect is prerenal in nature and due to a negative nitrogen balance, which occurs even in healthy patients receiving this class of drugs.

Gabuzda et al found that chlortetracycline increases the urinary excretion of tryptophan, histidine, threonine, and riboflavin in normal subjects. The increases in excretion of these metabolites are not of sufficient magnitude, however, to be of nutritional significance. Shils reported that patients with significant renal impairment developed increased azotemia, hyperphosphatemia, acidosis, weight loss, anorexia, and vomiting when given tetracycline. Similar observations were reported earlier by Bateman et al and Faloon et al. Thus, in administering tetracyclines to patients with renal impairment, it is important to use these drugs in doses that will not produce these untoward effects.

Frimpter et al and Gross observed a syndrome of nausea, vomiting, proteinuria, acidosis, glycosuria, and amino-aciduria in patients who ingested capsules containing deteriorated tetracycline. The renal lesion in these patients, which appeared to be entirely reversible, resembled the Fanconi syndrome. In most cases the drugs were markedly outdated; in two, the patients had used capsules that previously had been carried on extensive trips abroad. In two cases, Frimpter et al obtained some of the unused capsules and found that they contain a hard black plug. Analysis by the manufacturer revealed that approximately 23.7 percent of the original 250 mg of tetracycline hydrochloride in each capsule was present in the form of anhydrotetracycline and 61.6 percent was present as epianhydrotetracycline. Since these derivatives of tetracycline develop under moist, acid conditions, the capsules should be stored under dry conditions; also, citric acid is no longer included in the formulation of the capsules. Frimpter et al stressed that there is no evidence that fresh or pure tetracycline hydrochloride produces the Fanconi syndrome.

Benitz and Diermeier, using rats and dogs, studied the renal toxicity of three degradation products of tetracyline (4-epitetracycline, anhydrotetracycline, and anhydro-4-epitetracycline) that are formed under the influence of heat, moisture and low pH. Of these, only anhydro-4-epitetracycline produced abnormal urinary findings similar to the Fanconi-type syndrome observed in man. The lesion in these animals was necrosis of the cortical renal convoluted tubules with relative sparing of the ascending limb of Henle's loop. Severe swelling of renal tufts also was found. A human renal biopsy as reported by Mavrommatis revealed degenerative changes in the distal convoluted tubules, while the glomeruli appeared to be remarkably uninvolved.

Amphotericin B.—The administration of amphotericin B, an extremely useful drug in the treatment of systemic fungus diseases, is frequently associated with proteinuria and azotemia, which appear to be dose related. Rhoades, Bell et al, and others reported clinical and experimental studies of the nephrotoxicity of amphotericin B in man and animals. Doses of this drug necessary to treat systemic fungus infections cause decreases in the clearance of inulin, the mean clearance of para-aminohippuric acid (PAH), and the maximal concentrating ability of the kidney. These functions generally return toward normal after cessation of therapy, but progressive and fatal renal disease can occur. According to Butler et al, the injection of amphotericin B causes a marked renal vasoconstriction that in turn causes depression of renal blood flow, glomerular filtration, and tubular transport of PAH. In the toad bladder, amphotericin B has been shown to stimulate sodium transport. The renal lesions found on biopsy or autopsy consist of a glomerulitis, involving the juxtamedullary glomeruli, and calcium desposits within tubules of the distal portion of the nephron adjacent to the medullary rays.

Polymyxin B and Colistin (Polymyxin E).—These agents are considered together because they are closely related polypeptide antibiotics, and both are effective against *Pseudomonas* species and other gram-negative bacteria. Both are potentially nephrotoxic and appear to have about the same therapeutic index experimentally in animals. Their main clinical differences are in form and dosage. Colistin is given parenterally in the form of sodium colistimethate, the methanesulfonate derivative of the antibiotic, whereas polymyxin B is given as the

sulfate. The total daily doses of these drugs, which are given in divided amounts, are: polymyxin B sulfate, 2.5 to 3.5 mg per kilogram (1.2 to 1.6 mg/lb) of body weight in patients with normal renal function; and sodium colistimethate, as high as 5 mg/kg (2.3 mg/lb). Both drugs are fairly well tolerated in subjects without renal impairment.

Fekety et al reported that none of the patients in their series who had good renal function developed signs of nephrotoxicity when treated with colestimethate, and most patients with previous renal disease tolerated the drug quite well. However, 5 of the 24 azotemic patients receiving this drug developed an alarming increase in blood urea nitrogen; these values did not return rapidly to normal when therapy was stopped or reduced, but did eventually return to normal when other causes of renal insufficiency were corrected. Hopper et al, Yow and Moyer, and Parker and Hoeprich reported similar experiences with polymyxin B. A beneficial aspect of the introduction of colistin into therapeutics is a reawakening of interest in polymyxin B; there is as yet no satisfactory evidence that one of these agents should be preferred over the other.

Kanamycin, Neomycin, and Paromomycin.—Kanamycin and neomycin are closely related chemically and are virtually identical in antimicrobial spectra and activity. Experimentally in animals, the nephrotoxicity of neomycin has been shown to be greater than that of kanamycin, and clinical cases of nephrotoxicity have been documented. For parenteral use, kanamycin has virtually replaced neomycin. These two drugs and paromomycin, which is closely related and also has nephrotoxic properties, may be used interchangeably by the oral route to diminish the fecal flora except in patients with concomitant renal impairment. Although these drugs are poorly absorbed from the gastrointestinal tract, the small amounts that are absorbed tend to be retained by uremic patients, and this may result in blood levels comparable to those achieved after injection and the production of toxic reactions. Because kanamycin is less nephrotoxic, it is preferred for oral use in azotemic patients.

The renal lesion produced by these three drugs primarily involves the proximal convoluted tubules. Clinical manifestations include decreases in glomerular filtration rate (fall in inulin or creatinine clearance), the clearance of PAH, and the maximal tubular concentration; less often, proteinuria and microscopic hematuria occur. Kanamycin sulfate is ordinarily given in doses of 0.5 gm, intramuscularly, twice daily. Larger doses may be used in severe infections, but the dose should be reduced to 1 gm/day as the patient improves. Parenteral forms of paromomycin are not marketed in this country.

Bacitracin.—Bacitracin, a polypeptide antibiotic, has an antibacterial spectrum similar to that of penicillin. It is resistant to the action of penicillinase and formerly was widely used parenterally in the treatment of staphylococcal infections resistant to penicillin. However, the current availability of a large variety of penicillinase-resistant penicillins and of cephalothin and its derivatives for patients allergic to penicillin has reduced the therapeutic role of bacitracin in adults and older children. Eichenwald and Shinefield reported no lasting renal toxicity in 100 newborn full-term and premature infants treated with bacitracin. Their recommended daily dose for full-term infants is 1,000 units/kg (450 units/lb) of body weight given in divided doses at 8- or 12-hour intervals by deep intramuscular injection; for infants weighing less than 2.5 kg (5 lb), this dose is reduced to 900 units/kg (410 units/lb) per day. Therapy with bacitracin is discontinued after a week to 12 days. Its use is restricted to treatment of penicillin G-resistant staphylococci.

Bacitracin has marked nephrotoxic properties and produces destructive lesions of the proximal and distal convoluted tubules. Abnormalities in function and urinary sediment have been noted in patients receiving doses of 400 to 4,000 units/day. Results of almost all renal function tests are abnormal, including decreases in clearance of inulin and PAH, maximum tubular reabsorption rate for glucose (TmG), and maximum tubular excretory capacity for PAH (TmPAH). Proteinuria and urinary casts are found, but hematuria is rare. The changes may be reversible several months after the drug has been discontinued. Bacitracin remains useful for topical therapy and as one type of therapy for staphylococcal enterocolitis (however, vancomycin can also be used for this condition).

Dialysis of Nephrotoxic Antibiotics

MacKay and Kaye studied elimination of colistin by hemodialysis in three patients and, over a five-hour period, observed no fall in serum concentrations as measured by the two-fold dilution method. Gombos et al employed hemodialysis for periods of up to ten hours and the more quantitative cup-plate assay and obtained reductions in serum levels of 57 percent to 66 percent as compared to 33

percent to 59 percent over the same time period without dialysis; thus, some colistin may be removed by hemodialysis. Greenberg and Sanford reported that only small amounts of the drug are removed by peritoneal dialysis.

Kanamycin is effectively removed by both hemodialysis and peritoneal dialysis. Gombos et al reported virtually no change in serum concentrations of this drug over six to eight hours in undialyzed anuric patients, whereas hemodialysis produced a decrease in serum concentrations of 31 percent to 72 percent. Greenberg and Sanford reported that 41 percent of the administered dose of kanamycin was removed by peritoneal dialysis over a period of about 58 hours.

Principles of Modified Dosage in Uremic Patients

Some of the antibacterial agents that produce nephrotoxic effects are of great value in chemotherapy, and the following portion of this discussion deals with the principles of a modified dosage schedule for antimicrobial agents in patients with severe renal disease.

The Figure gives a hypothetical representation of the relationship between half-life in serum after a single intravenous injection and the degree of impairment of renal function for two classes of drugs, one of which (A) is cleared only by the kidney and the other (B) only by nonrenal mechanisms. The active form of drugs in class B would never accumulate in the blood of the patients with uremia, because they are removed independently of the kidneys. Antibacterials in this category are chlortetracycline, erythromycin, chloramphenicol, novobiocin, and probably isoniazid. These antibacterial agents are, for the most part, converted to an inactive metabolic product by mechanisms such as conjugation with glucuronic acid or acetylation. The metabolic products accumulate in the presence of renal failure but appear to be nontoxic and present no known threat to the patient.

The degradation of chlortetracycline, in vivo, to an inactive product raises the question as to whether this product may have some of the nephrotoxic properties observed with degraded tetracycline, as previously discussed. There does not seem to be such a problem, because in neutral or alkaline conditions chlortetracycline is converted to isochlortetracycline, which has no significant toxicity. However, Shils has recently presented preliminary evidence that chlortetracycline given to uremic patients still produces the elevation of urea nitrogen observed with other tetracycline derivatives despite maintenance of a relatively low blood level. Accordingly, it may be wise to use reduced doses of one of the other tetracycline analogues, which are similar to group A in their manner of clearance.

Drugs in group A are removed, by definition, entirely by the kidney. Inulin and mannitol are examples of such compounds. There are many other drugs that behave so similarly that the relationship shown by the curve for group A is valid for purposes of analysis. In addition to the tetracyclines other than chlortetracycline, some of the antibiotics that resemble group A are streptomycin, the polymyxins, kanamycin, gentamycin, vancomycin, and probably amphotericin B. It is not necessary to restrict dosage of these drugs in patients whose renal function is in excess of 25 percent of normal. On the other hand, the half-life in serum of these antibiotics rises steeply as renal function falls below 25 percent of normal, and reduction in dosage is necessary. Blood urea or creatinine levels may be used as a guide since, in general, they do not rise unless renal function is less than 25 percent of normal. Serum creatinine is somewhat the better guide, because the blood urea level varies with the nitrogen load, state of hydration, and rate of urine flow.

Some drugs appear to be metabolized in a manner intermediate between groups A and B. Antibiotics in this category are the penicillins, lincomycin, cephalothin, and cephaloridine, a new analogue of cephalothin. For example, the half-life of penicillin G in a normal person is one-half hour and rises to about ten hours in a totally anuric individual. This effect is of no great therapeutic importance because penicillins are relatively nontoxic. However, convulsions have been reported in five patients with renal disease who were treated with massive doses of penicillin G. In normal subjects, the half-life in serum of cephaloridine (1.52 hours) is more prolonged than that of cephalothin (0.85 hours); after the initial dose in anuric patients, these half-lives are increased to 24 hours with cephaloridine, but to only 2.9 hours with cephalothin. Kabins and Cohen observed that the half-life of cephalothin in anuric patients rises to 18 hours after multiple doses. Presumably, conversion and retention of the antimicrobially active desacetyl derivative accounts for the diphasic curve they observed.

Infection with gram-negative organisms is one of the most serious complications of the management of the uremic patients, and a frequent problem in such patients is whether or not to use potentially nephrotoxic antimicrobial agents when the orga-

nisms may be sensitive only to these drugs. The question often arises whether the treatment will be worse than the disease.

The antibiotic sensitivity of the gram-negative bacillus may not, as yet, have been established, or the organism may be responsive only to kanamycin or the polymyxins (since polymyxin B and colistimethate exhibit complete cross sensitivity and cross resistance, sensitivity tests need be made only for one). When such a situation is encountered in a patient with preexisting renal disease, the clinician should not hesitate to use kanamycin or polymyxin B, or both simultaneously, according to the following schedule. Anuric patients are given a loading dose of 1 gm of kanamycin sulfate, or of 100 or 150 mg of polymyxin B sulfate, in divided doses by the intramuscular route, and one half the loading dose is then given at intervals of two to four days. Patients who are recovering from anuria and are in the diuretic phase of acute tubular necrosis, and uremic patients whose glomerular filtration rate is estimated to be greater than 10 ml/min, receive the same loading dose and subsequent doses of one half the loading dose at intervals of one to two days.

As reported by Atuk et al, we have used these dosage schedules with remarkable success in over 25 adults with life-threatening infection without encountering evidence of nephrotoxicity. Other investigators also have reported good results with the dosage scheme outlined for kanamycin. Bates et al derived a similar schedule using blood levels of kanamycin to monitor the dose according to creatinine clearance. Ory et al and Quinn et al presented data which indicated successful use of kanamycin in uremic patients when it was used according to this schedule.

MacKay and Kaye reported that the persistence of colistimethate in serum of patients with 40 percent to 68 percent of normal urea clearance was essentially the same as in patients with normal renal function, but serum levels persisted for as long as 72 hours after a single injection in patients with frank azotemia and urea clearance lower than 40 mg/100 ml. These authors recommend the following dosage schedules for patients with varying degrees of kidney function: normal urea clearance, 2.5 mg sodium colistimethate per kilogram (1.2 mg/lb) of body weight every 12 hours; urea clearance from 40 percent to 70 percent of normal, 1.2 to 2.5 mg/kg (0.6 to 1.2 mg/lb) every 12 hours; urea clearance from 10 percent to 25 percent of normal, 2.5 mg/kg (1.2 mg/lb) every 36 hours; and urea clearance less than 10 percent of normal, 2 mg/kg (0.9 mg/lb) every 48 to 72 hours.

A detailed table describing the fate of various antibiotics in patients with renal disease, together with recommended dose schedules, has been recently published.

Summary

Potentially nephrotoxic antibiotics, such as kanamycin, polymyxin B, and colistimethate are, for practical purposes, removed entirely by the kidneys. The same is true of some antibiotics that are either non-nephrotoxic (streptomycin) or that have shown nephrotoxic properties only when taken in outdated and degraded form (tetracycline hydrochloride). These antibiotics are retained in the presence of uremia. When they are needed in patients with concomitant renal failure, they can be used safely and effectively if given in reduced doses as described in this communication. Of the nephrotoxic antibiotics, some colistin can be eliminated by hemodialysis, and kanamycin can be effectively eliminated by hemodialysis or peritoneal dialysis.

Generic and Trade Names of Drugs

Kanamycin sulfate—*Kantrex.*
Polymyxin B sulfate—*Aerosporin.*
Amphotericin B—*Fungizone.*
Tetracycline—*Achromycin, Panmycin, Tetracyn.*
Chlortetracycline—*Aureomycin.*
Sodium Colistimethate—*Coly-Mycin Injectable.*
Penicillinase—*Neutrapen.*
Chloramphenicol — *Chloromycetin, Cylphenicol, Tega-Cetin.*
Isoniazid—*Niconyl, Nydrazid, Tyvid.*
Mannitol—*Osmitrol.*
Cephaloridine—*Keflordin.*

(The omitted figure and references may be seen in the original article.)

PREVENTION OF LOW BACK PAIN

Hans Kraus, MD, New York, N.Y., J Occup Med 9(11):555–559, November 1967.

Low back pain accounts for an ever-increasing number of disability cases in the labor force, as well as of sedentary office workers.

To investigate the cause of these frequent disabilities, a clinic was organized at Columbia-Presbyterian Hospital and, later, at New York University Institute for Physical Medicine and Rehabilitation. In these clinics, patients were examined by representatives of all specialties involved in management of low back pain. The group consisted of internists, rheumatologists, neurosurgeons, orthopedic surgeons, and specialists in physical medicine. All patients were evaluated by each member of this team.

Survey

Surveys of over 5,000 patients seen in these clinics showed that over 80 percent had no organic disease, no structural problem, or any neurological involvement. However, examination of key posture muscles with six simple tests revealed either weakness or stiffness of one or more of these muscle groups. Palpation of soft parts frequently showed localized tenderness—triggerpoints—either in the muscles proper or in their ligamentous and tendinous insertions.

Injection at triggerpoints and follow-up treatments with exercise to strengthen weak muscles and limber, relax, and stretch tight muscles, resulted in satisfactory results in a high percentage of cases.

Etiology

Follow-up studies led us to believe that muscle deficiency and triggerpoints were the cause of back and neck pain in most of our patients. It was apparent from these studies that under-exercise followed by disuse atrophy played an important part in the etiology of back pain. We were equally aware that tension followed by muscle stiffness was another important factor. Continued observation made it evident that in sedentary patients, back and neck pain were merely leading symptoms of an over-all imbalance produced by sedentary lives and exposure to over-irritation. This combination characteristic for our mechanized civilization (including over-rested, over-fed, over-stimulated, over-protected, under-exercised, under-released, under-disciplined individuals) results in suppression of flight and fight response which in turn act as stressors. Our bodies, unprepared to adapting to this chronic strain, become susceptible to different diseases of which back pain is only one.

Many publications point to the role of this imbalance in etiology of cardiovascular disease, diabetes, duodenal ulcer, tension syndrome, and in the health hazards of overweight.

History of patients with back complaints includes poor working posture, stressful working conditions, aggravated by stressful commuting, emotional stresses at home or at work and, of course, basic emotional problems. Another frequent factor is disturbed endocrine balance.

Trauma.—In our active patients, the original back or neck problem frequently was caused by adequate trauma, such as: falls, car collisions, lifting of excessive weights, or other mishaps connected with their occupations. This first injury, more often than not, treated with rest and immobilization, and not followed by adequate reconditioning of secondarily deficient muscle groups, was then the cause of muscle imbalance. This, in turn, led to recurrence of back pain due to subadequate trauma or merely to distresses of every-day living that would not normally have affected these well-conditioned people. In other words, these originally physically strong, flexible, and physically active patients were thrown off their normal balance by their first accident and then fell into the pattern of the first described under-exercised and over-stressed patient.

Treatments directed toward relieving localized muscle pain by injection of medication at triggerpoints and reconditioning of weak and stiff muscles by systematic exercises showed satisfactory results.

Treatment Procedure

After the acute episode had subsided, all patients were examined for their minimal muscular fitness and then were subjected to the following tests:

Their soft parts were palpated for localized tenderness—triggerpoints. When triggerpoints were identified, they were treated individually with injections of 10 percent lidocaine solution. After marking of

Dr. Kraus is Associate Professor of Physical Medicine and Rehabilitation at New York University Medical School, New York, N.Y.

Presented at the 52nd Annual Meeting of the Industrial Medical Association, New York, N.Y., Apr. 10–13, 1967.

the triggerpoints by a needle scratch on the skin, injection was performed under sterile conditions. The triggerpoints were thoroughly needled and infiltrated with Xylocaine.* After injection, the patient was treated on 3–4 successive days with sinusoidal current, ethyl chloride spray, and gentle limbering movements to relieve post-injection spasm. Without this after treatment, injection results are not encouraging.

Triggerpoints at the ligamentous insertions were infiltrated with 0.5 cc. hydrocortisone and lidocaine and 10 cc. Xylocaine, much the way epicondylitis in tennis elbow is treated. These injections do not provoke postinjection spasm and need no aftertreatment.

The patients were then started on a gradually increasing program to strengthen muscles that were found weak at the muscle tests and to limber, relax, and stretch tight muscles. Programs of exercises were individually prescribed depending on individual needs. The patients were given these exercises gradually, step by step, under constant supervision. Only when they had learned to do these exercises properly were they taught their programs and permitted to do them at home. These patients were not discharged until they had reached complete flexibility and strength of key posture muscles, as postulated by the Kraus-Weber tests. It is understood that during this time, every effort was made to help the patients adjust to situational problems and to deal with their tensions (with tranquilizers if necessary) by changes in their lives, attitudes, or with psychiatric help. Furthermore, they were studied for their working posture and advised how to make changes (if necessary). They were investigated for their endocrine balance and given medication when necessary. The most frequent complications causing muscle pain in multiple triggerpoints are hypothyroidism and menopausal problems.

Discussion

The basic principle of management remains the evaluation of muscle status, the relief of tender trigger areas by lidocaine infiltration, and gradual reconditioning by properly prescribed and carefully and continuously supervised exercises. Under this regimen, even long-lasting complaints could be gradually relieved and recurrences avoided.

Appraising the muscle status of patient and of healthy persons coming for their yearly check-ups will permit a prevention of even initial episodes. Reconditioning programs given to people found deficient in strength or flexibility of key posture muscles will improve their chance to avoid back problems. In addition, there will be better risks for other under-exercise and over-stress disease, e.g., cardiovascular disease, if the exercise program expands to these fields. Such programs are in effect in many countries abroad and have shown favorable results.

It is at this time that we advise the patient who comes for his yearly check-ups not only of the fact that he is "doing very well"—even though he may show slightly high blood pressure and cholesterol level—but we use these early warning signs to affect changes in diet and physical activity. At the same time, evaluation of muscle status will show whether the patient is adequately equipped to meet the physical stresses of everyday life. Where he becomes borderline, he should not be told to "be his age" but should be advised to participate in reconditioning programs that will make it possible for him to continue and to even increase his physical activity.

Summary

In the majority of patients with complaints of back trouble, the problem is not one of local derangement but rather of a general imbalance. Many factors, including emotional and glandular imbalance, may combine with true mechanical difficulties. However, the immediate cause of symptoms in over 80 percent of cases is muscular.

A thorough muscle examination including tests for strength and flexibility of key posture muscles and palpation for localized tenderness (triggerpoints) are an essential part of every back examination.

Reconditioning of deficient muscles and injections of prescribed medication at triggerpoints can relieve and prevent back pain.

(The omitted figures and references may be seen in the original article.)

* Astra Pharmaceutical Products, Inc., Worcester, Mass.

TOXIC MARINE LIFE

CDR Paul G. Linaweaver, MC USN, Milit Med 132(6):437–442, June 1967.*

In this brief presentation on toxic marine life, emphasis is placed on those organisms most likely responsible for injuries and illness brought to the military medical officer for treatment. Those interested in a more complete listing and description of toxic marine species than given here are referred to a new publication from the US Government Printing Office by Commander Bruce Halstead, MC, USNR, entitled, Poisonous and Venomous Marine Animals of the World, undoubtedly the most complete collection of information on this subject available.

Since World War II, there has been an unprecedented increase of interest and activity in the exploitation of the water mass of earth. Tens of thousands of persons now own their own self-contained diving equipment, hundreds of thousands are avid skin divers; representing just a portion of the multitudes that are turning to the sea pursuing occupational and recreational activities. As the world's population continues to expand, more and more the sea is becoming a major source of food, in particular, protein foods. The sea abounds with sea life suitable for consumption as food, however, many species are unsuitable because they are violently poisonous to eat. Others are hazardous to catch because they are venomous. Thus, with increasing numbers of people going into the sea for recreation or work and with the increasing dependence on the sea for food, it is no surprise that morbidity and mortality due to harmful marine life is also increasing.

Poisonous Marine Life

Poisonous fish are found in wide areas of tropical waters, particularly in the Indio-Pacific and Caribbean waters, usually in shallow depths around islands and reefs. Although it is not completely understood how a fish becomes toxic, most experts agree the "food-chain" is a determining factor. Herbivores eat algae and corals from which toxins are derived which become distributed throughout the flesh, liver, intestines and sexual organs. Carnivores feed on the herbivores assimilating the toxin. Pelagic species may become toxic when they feed on reef species. This is particularly true when these, usually deep water fish, are uncommonly large and, therefore, are older and slower being unable to pursue their usual faster deep-water prey. These overlarge fish are extremely dangerous, as are the moray eels, whose diet consists almost exclusively of reef species. Plankton, particularly dinoflagellates, have not been proved to cause fish to become poisonous as a result of being eaten, but have been implicated in mussel and crustacean toxicity. Radiation contamination of fish has no bearing on fish poisoning *per se* but may pose a radiation hazard. In dealing with those poisonous fish—those responsible for poisoning due to ingestion as contrasted to the venomous sea life that are capable of venenation—it is convenient to classify them according to the clinical syndrome produced by the intoxication.

Puffer Poisoning

The poisoning caused by ingestion of puffer fishes represents a most serious menace in the Pacific, particularly in Japan where specially prepared puffers are considered a delicacy. Specially licensed and trained chefs prepare the fish called *Fugu*, but apparently minor mistakes in processing may result in a delicacy becoming a disaster, causing violent illness. The toxin has a curariform neurotoxin which causes weakness and progressive paralysis. In addition, a sympathetic-parasympathetic dysfunction occurs producing hypersalivation, massive diaphoresis, bronchoconstriction, and profuse bronchial mucous secretion. Death results from medullary depression with cardiovascular and respiratory failure—usually within 24 hours. The mortality rate is 60 percent according to Japanese statistics. Troops in the Japan-Korea-Okinawa area should be specifically warned about eating this fish, no matter how impressive the cook's "*curriculum vitae*" may appear. No specific therapy such as an antitoxin exists and symptomatic and supportive treatment is indicated. Respiratory stimulants, artificial respiration, tracheostomy, vasopressors, digitalization and careful use of cholinergic drugs are helpful.

Scombroid Poisoning

Skipjack, Tuna, Bonito and other mackerel-like fishes may become toxic as a result of enzymatic conversion of histidine to histamine and saurine by

* Deputy-Director and Chief, Biomedical Sciences Division, Naval Submarine Medical Research Laboratory, Naval Submarine Medical Center, Naval Submarine Base New London, Groton, Conn. 06340.
Presented at 1966 AMSUS Convention.

proteus morganii; bacteria naturally residing in this fish. These species, with improper or delayed refrigeration, are prone to develop toxicity very rapidly. This process is not to be confused with putrefactive changes. Flesh of these fishes, when toxic, is reputed to have a sharp, metallic or biting taste, though the lack of any specific abnormal taste does not guarantee that the flesh is suitable to eat. Symptomatology of scombroid poisoning is essentially that of severe histamine effect. Characteristically present are flushing, headache, urticaria, angioneurotic edema, asthmatic dyspnea, abdominal pain and diarrhea. Signs and symptoms usually develop very shortly after ingestion lasting 6 to 12 hours. Large doses of antihistamines and injectable corticosteroids are specific for this condition. Mortality is rare in otherwise healthy persons.

Ciguatera Poisoning

Ciguatera intoxication is of particular importance because of the wide range of distribution among species and the lack of consistent involvement within species, location or time of year. It is most unfortunate that many of the staple food-fish are involved such as snappers, grouper, skipjack, barracuda, etc. Since over 300 species of fish have been documented to be poisonous with the ciguatera toxin, yet to be completely defined, it follows that probably any fish may acquire this toxicity, given the right conditions of diet and locale. The greatest hazard lies in the fact that no practical method of determining toxicity is available. Various methods have local popular belief such as color change to copper or silver coins on the fish flesh, color of blood from cut gills and the fighting qualities of the caught fish. The most reliable test is still to feed a portion of the suspected (or unsuspected) fish to a cat, preferably a neighbor's, and if no ill effect is noted within 12 hours, the fish is usually safe to eat. *All oversized fish of any species is suspect and should not be eaten.* It is the author's opinion that the ciguatera type and the gymnothorax (moray eel) poisoning described by most writers on the subject, represent a single syndrome with that caused by ingestion of moray flesh usually causing a moderate to severe form.

Symptoms of ciguatera intoxication are varied, labile, bizarre and most frightening to both patient and physician. Symptoms usually begin within 3 hours following ingestion of toxic fish products. The toxin is heat stable, therefore, cooking is no protection against intoxication. The first symptoms are usually numbness and tingling about the lips and mouth and a feeling of thickness of the tongue. These vague symptoms then spread peripherally in a patchy fashion. Malaise and myalgia associated with muscular weakness is characteristic. Paresthesias are common, and in this regard, the pathonemonic sign of ciguatera intoxication is the reversal of temperature perception, i.e., cold feels hot and vice versa; a condition which may last for months after recovery. In severe cases, paralysis, athetoid movements, convulsions and coma are seen. Death occurs by respiratory failure. Treatment has usually been symptomatic. Recently, treatment with Tensilon (*) and neostigmine with hydrocortisone resulted in dramatic improvement in what appeared to be a terminal case, was reported by Shaw. He also cautions against the use of antihistamines and sedative antiemetics, such as chlorpromazine, as they may seriously depress consciousness and respirations in these patients.

Because of the widespread occurrence, severity, and lack of specific toxicologic and therapeutic information, ciguatera fish poisoning is presently one of the major public health problems in tropical maritime areas.

Other types of fish poisoning such as Elasmobranch (sharks), Clupeoid (herring) and Hallucinatory Mullet poisoning are mentioned for completeness but will not be discussed. Similarly, poisoning by molluscs such as paralytic shellfish poisoning, will not be discussed. This latter entity is of significant magnitude and economic importance to be a topic of discussion itself.

Venomous Marine Life

Turning the discussion now to that group of marine organisms which is capable of venenation, the venomous marine species, we find organisms that run the gamut from those which are merely a source of irritation to those which are the most deadly of all marine life. These are best discussed according to their phylogenetic classification, beginning with vertebrate and invertebrate.

Invertebrates

Venomous marine invertebrates include Annelid Worms, Echinoderms, Coelenterates and Molluscs.

Annelid Worms

There are several venomous species of Annelids; the bristle worms, which have tufts of irritating toxic setae, and the blood worms, which possess

* Edrophonium chloride, Roche Laboratories, Division of Hoffmann LaRoche Inc., Nutley, N.J.

biting jaws believed capable of injecting a mild toxin. No serious morbidity has been attributed to this class. Only local antiseptic and analgesic treatment to the involved area is necessary.

Echinoderms

In the phylum of Echinoderms, of particular interest are the sea urchin species and the spiny-starfish. Sea urchins are abundant in shallow tropical waters and have numerous sharp, retrorse barbed, brittle spines that can penetrate the skin with ease; and because of their brittleness, are practically impossible to remove from the flesh intact. Most imbedded spines are absorbed within 48 hours, however, some spines are heavily calcified and are not absorbed, setting up an intense foreign body reaction. These must be surgically removed. It is common practice among some Micronesians to pound the imbedded spines with a rock or other hard object crushing them, thus hastening resorption. Secondary infection is the rule following penetration with spines. Appropriate antisepsis is indicated. Many species have spines which are hollow and contain a venom that causes considerable pain, but is otherwise not dangerous to man. Some urchins have well developed grasping venomous organs called pedicellariae. The pedicellariae toxin of several species is quite dangerous to man with neuromuscular impairment. Treatment is symptomatic with special attention given to the prevention of asphyxia due to muscular paralysis.

The spiny-starfish is a grotesque, multi-colored starfish with up to 16 rays or arms bearing numerous tough, long, hollow spines, covered with an integument containing acidophilic and basophilic secretory glands. The former are believed to be the site of toxin production. The hollow center also contains secretory cells; whether these contribute to the toxicity is not known at present. Envenomation results in immediate pain, redness, numbness, and generalized weakness. It has been my personal observation that wounds from this starfish bleed an inordinate amount and duration, suggesting an anticoagulant activity. Treatment is symptomatic.

Coelenterates

Coelenterates form a large phylum in which the presence of tentacles equipped with poisonous nematocysts is a dominant characteristic. The nematocyst is a very complex cell organoid containing a coiled hollow stinging thread and venom capsule. When stimulated, the thread is discharged into the offending object and venom is injected. Important in this group are the Hydroids, with the fire or stinging corals and the Portuguese Man-O'War; and the true jellyfishes. In this latter class are some of the most dangerous marine animals known, especially the Sea-wasps of the tropical Pacific. One species is known to have caused human deaths in less than one minute after having been stung. Ordinarily, Coelenterate stings cause pain, swelling and redness that may last several hours. Stings by certain jellyfish cause severe muscular cramps, especially abdominal spasms, sufficiently incapacitating so as to render a swimmer helpless and subject to drowning. The author has used slow intravenous infusion of calcium gluconate and hydrocortisone over several hours which results in dramatic relief of persons severely stung by jellyfish.

This treatment probably would be helpful with victims stung by Sea-wasps, if it could be accomplished soon enough, but the toxin has a very rapid action. Because of this rapidity of action, some workers believe that death is due to anaphylactic shock, not to the toxin per se; yet others show good evidence that the venom has at least three fractions having lethal properties.

Molluscs

The species of venomous cones are the principal molluscs that will be considered. These beautiful shells are equipped with a highly developed venom apparatus from which a poisonous, dart-like radular tooth is thrust into flesh and venom injected. The venoms of several cones including Geographer, Tulip, Textile, Marbled and Court cones are quite virulent. Human poisonings have occurred as a result of ignorance of their potential toxicity or through careless handling. Initial pain at the sight of puncture may be intense, later numbness begins and spreads centrally associated with muscular weakness. Diplopia, aphonia, dysphagia and coma may develop in severe cases. Recently two deaths occurred on Guam due to respiratory failure followed by cardiac arrest, in spite of supportive care. Both victims were envenomed by Conus *geographus*. On the basis of thirty or more recorded cone envenomations, the fatality rate approaches 25 percent, with Textile and Geographer cones being the most lethal. In general, the toxin acts as a powerful curariform drug and may have effect on the central nervous system.

Vertebrates

Although there are other poisonous vertebrates, only stingrays, scorpion fish and sea snakes are

mentioned now because of their relative importance.

Stingrays

Stingrays constitute a major problem for bathers and skin divers. These fish lie partially buried in mud and sand and may easily be stepped on or swum over, causing the ray to lash out defensively with its whip-like tail of which the sting is an integral part. The sting consists of a hard, bone-like, toothed spear having several grooves on the ventral side, containing toxin producing glandular tissue covered with a thin integument. It is thrust with great force into the victim even, at times, penetrating the bone, causing a ragged laceration containing slime, debris, and venom. Pain is immediate and severe. Systemic symptoms of shock usually occur and should be treated quickly. These wounds are invariably grossly contaminated and secondary infection is common. Death is rare and has usually been in cases in which the spines have entered the peritoneal or pleural cavities. The annual incidence of stingray injuries in the United States is about 1500 cases. Additional treatment will be described with the care of venomous fish injuries.

Scorpion Fish

Stings are very common as these species are widely disseminated about the world in all tropical and temperate waters. There are three major types of scorpion fish: Zebra fish, Scorpion fish proper and the Stonefish.

The Zebra fish, or Turkey fish, is a graceful, colorful, fearless fish with rather long, lacy dorsal and pectoral fins containing venomous finspines. Because they are fearless, slow moving and attractive, many persons are stung while trying to catch these animals. As a spine enters the flesh, the thin integument is torn away exposing the small, but well developed, venom glands that lie in groves on either side of the spine. The true scorpion fish, as exemplified by the *Sculpin* which plagued SeaLab II by the hundreds, including the stinging of astro-aquanaut Scott Carpenter, is a well camouflaged bottom dweller bearing numerous venomous dorsal spines that have large well developed venom glands. These spines are ductless and envenomation occurs as with the zebra fish. The stonefishes are truly the most horrible, repulsive and dangerous of the scorpion fishes. Their sedentary behavior, coloration that blends completely with the surroundings, and absolute fearlessness, create the hazard of accidentally stepping or sitting upon or touching these fish with one's hand. The venom apparatus of the stonefish consists of strong, sharp, dorsal spines, having definite venom ducts and large paired highly developed venom glands. Of the three types, the venom of the stonefish is the most toxic both in terms of virulence and quantity.

Envenomation by a scorpion fish results in varied symptomatology depending on species and quantity of released venom. In general, immediate severe pain, cyanosis and swelling about the site occur. Pain and swelling spreads centrally. In the case of the stonefish, the pain is indescribably severe, barely mitigated with large doses of morphine. Swelling is rapid and massive. In treating cases, one gets the impression that the venom must contain proteolytic, thrombogenic and vasoconstrictive fractions; because, very quickly, the tissue surrounding the site of envenomation becomes necrotic and a large slough occurs that may take as long as six months to heal. This is particularly true in cases where treatment is delayed. Certain sources of information advise immersing the affected site in ice water for several hours. It is the opinion of the author and others that *cryotherapy is contraindicated*. Best success for relief of pain and prevention of large amounts of tissue loss is obtained by immediate immersion of the site in hot water of 110–115°F for thirty minutes. When such treatment is given early, relief is dramatic, suggesting heat lability of the venom. An unaffected region should also be immersed to prevent serious scalding since the pain of the lesion is so great that pain from heat would not be perceived. Antibiotics, debridement, and antitetanus therapy is also indicated. This treatment is recommended for all scorpion fish and stingray injuries and may also prove beneficial for poisonous cone stings.

Sea Snakes

Sea snakes are considered because of their exclusive marine habitation. They are characterized by a flattened oar-like tail and the presence of short, immovable, deeply grooved, paired fangs located at the very front of the upper jaw. These snakes are primarily found in the tropical Indio-Pacific waters and are allegedly not aggressive. Because of the short fangs and mouth size, only about 1 case out of four receives sufficient venom to produce symptoms. The venom, however, is a very potent neurotoxin being similar to cobra-krait venom. Insidiously and painlessly, after the initial fang prick, over several hours, myalgia, stiffness and muscular

weakness develops. Physician and patient alike may fail to associate the symptoms with a mild insignificant prick received hours previously in the water. Ascending paralysis develops resembling poliomyelitis or Guillain-Barré syndrome. Trismus and ptosis of the eyelids are said to be characteristic. For reasons not completely understood, myoglobinuria develops with its characteristic reddish-brown color. As the condition progresses, tracheal intubation, tracheostomy and artificial respiration are required. Specific therapy with Sea Snake Antivenom produced by the Commonwealth Serum Laboratories, Melbourne, Australia should be given until all symptoms subside. Without antiserum, prognosis is guarded with an overall mortality rate of 25 percent.

Conclusion

The sea harbors numerous potentially harmful marine species. It is incumbent on military medical officers to be prepared to diagnose and treat conditions caused by these organisms; and to prevent such accidents by proper indoctrination of those in their areas of responsibility in the potential hazards of marine life.

(The references may be seen in the original article.)

MEDICAL ABSTRACTS

PLAGUE EPIDEMIC IN NEW MEXICO, 1965

R. N. Collins MD, A.R. Martin MD, L. Kartman ScD, R. L. Brutsché MD, B. W. Hudson PhD, and H. G. Doran DVM MPH, Public Health Rep 82(12):1077–1099, Dec 1967.

In a 1965 epidemic of bubonic plague among Navajo Indians in New Mexico, a total of six cases occurred in children between June 21 and September 1. This was the largest epidemic of plague in the United States in a single year since 1924. Epidemiologic investigation established a history of close contact with prairie dogs for five of the victims. One child died, and evidence of secondary plague pneumonia was found at autopsy.

The epidemic was the largest recorded in which each case in a human being was associated with a separate infective source in wild rodents. The cases occurred at a time when epizootics of plague were occurring among prairie dogs (*Cynomys gunnisoni zuniensis*) in New Mexico and Arizona.

Specimens from prairie dogs found dead, fleas from prairie dog burrows, and some fleas from field mice were infected with *Pasteurella pestis*. A cottontail rabbit, *Sylvilagus nuttallii*, was found dead from plague within the limits of a prairie dog colony undergoing an epizootic.

Serologic tests showed that domestic dogs in the affected areas had significant *P. pestis* antibody titers. None of the serums tested from wild rodents was positive for antibodies.

Evidence obtained during the study suggests that a combination of cultural and socioeconomic factors peculiar to the Navajos creates favorable and unique circumstances which make them far more likely than non-Indians to contact infective sources. Although the cases of plague in the Navajo children were not characterized by familial clustering, they can be considered a community cluster. Hypothetically, therefore, the Navajo Indian community represents a situation in relation to wild rodent plague that is different from the commonly accepted epidemiologic view in the United States.

During the summer of 1965, Federal, State, and other agencies concerned collaborated in a short-term emergency plague control program. The major activities consisted of medical surveillance, vector control, and public education.

Prairie dog burrows were dusted with 5 percent malathion and prairie dogs were poisoned. Domestic dogs, Indian homes, ceremonial grounds, camping areas, and other areas where people congregated were treated with insecticide. Emphasis was placed on sites where the plague victims lived and where they were known to have contacted infective natural hosts.

STUDIES OF VENEREAL DISEASE—III.

LT K. K. Holmes MC USNR, LCDR D. W. Johnson MC USN, and CAPT T. M. Floyd MSC USN, JAMA 202(6):467–473, Nov 6, 1967.

Previous studies of the treatment of nongonococcal urethritis (NGU) have generally not been

closely controlled, and have often produced conflicting results. In the present study, 96 men with NGU were treated with placebo or tetracycline hydrochloride while "confined" aboard an aircraft carrier at sea. A seven-day tetracycline regimen was more effective than a four-day tetracycline regimen or placebo in the short-term cure of NGU.

SOME NEURO-OPHTHALMOLOGICAL OBSERVATIONS

C. M. Fisher, J Neurol Neurosurg Psychiat 30(5):383–392, Oct 1967.

This paper records some neuro-ophthalmological observations made on the Stroke Service of the Massachusetts General Hospital. For the most part they are not mentioned in textbooks of neurology. Although they are but minor additions to the clinician's fund of knowledge, their recognition may aid in accurate diagnosis. Some are possibly of interest in their own right as illustrations of the integrated action of the central nervous system. Since the abnormalities are generally unrelated, they are discussed individually.

MAJOR HEPATIC RESECTIONS: ELECTIVE OPERATIONS

M. A. Adson MD, Mayo Clin Proc 42(12):791–801, Dec 1967.

Experience with 13 patients treated by total hepatic lobectomy, 3 by removal of half the right hepatic lobe, and 1 by resection of the major portion of the medial segment of the left lobe, has been reviewed. Not included were patients treated for smaller lesions and lesions involving only the lateral segment of the left hepatic lobe and presenting minimal technical problems. Major hepatic resections have been considered with reference to relevant anatomy, appropriate operative techniques, usefulness and limitations of certain diagnostic measures, and indications for operation.

Experience with the treatment of primary hepatic malignant lesions has been encouraging. Less satisfactory results of radical treatment of metastatic tumors emphasize the need for more precise techniques for the detection of small multiple lesions involving the liver or other sites.

One of 13 patients treated by total hepatic lobectomy died during postoperative hospitalization. Although the operative mortality rate of less than 8% for hemihepatectomy is somewhat encouraging, the series is small and this rate may be fortuitous. It is likely that total or extended lobectomy for lesions situated away from the vena cava or the hepatic vein to be preserved can be managed with an operative mortality of less than 10%. However, the management of lesions adherent to or encroaching on these vessels presents additional technical problems and greater risks. If the hazards inherent in methods for circulatory isolation of the liver prove to be minimal, all lesions may be managed more satisfactorily and safely in the future.

A HIDDEN DANGER OF POOLED PLASMA

M. Wood MD. W. R. Price MD, and D. Childers MT ASCP BB, Amer J Surg 114(5):629–635, Nov 1967.

A case report is presented of a fatal hemolytic reaction in a severely burned child (type A positive) who received transfusions of massive amounts of pooled plasma. Circulating anti-A antibodies were demonstrated immunologically.

An explanation of the antibody accumulation and the precipitation of red cell hemolysis is discussed. The physiologic function and action of serum haptoglobin in relationship to hemolysis and hemoglobinuria are presented.

Gamma globulin poor plasma was demonstrated to be free of the antibody danger of pooled plasma.

DENTAL SECTION

A STUDY OF TOTAL ORAL DEBRIS CLEARANCE

B. S. Manhold, J. H. Manhold, and E. Weisinger, J New Jersey State Dent Soc 39(2), Oct 1967.

A series of seven studies was conducted to determine the amount of oral debris which may be removed using various methods. Of these, the following four studies are reported:

1. The comparative efficacy of water and a number of commercial mouthwashes in removal of oral debris.

2. The efficacy of mouthwash compared with

water when combined with toothbrushing.

3. The effect of dental floss on total oral debris clearance.

4. The comparative efficacy of manual and automatic toothbrushes used with dental floss and mouth rinse.

Study 1: The amount of oral debris clearance achieved with water and with various mouth rinses.

The rinses studied were:

Rinse A = Antiseptic rinse containing neither quaternary compounds or surfactants.

Rinse B = Astringent mouth rinse.

Rinse C = Antiseptic rinse containing quaternary compounds and surfactants.

Rinse D = Buffered antiseptic rinse containing quaternary compounds.

Rinse E = Distilled water.

All rinsing solutions remove a certain amount of oral debris. Rinse C consistently removed significantly more oral debris than all other rinsing solutions tested.

Since Rinse C appeared to offer greater and more consistent debris removal, this mouth rinse was selected for use in all the remaining studies.

Study 2: The efficacy of mouthwash compared with distilled water when combined with manual toothbrushing.

Fifty subjects brushed their teeth following meals and either rinsed with distilled water or with "Rinse C". This was done for five weeks and the results showed that the use of "Rinse C" following manual brushing, produced a highly significant greater debris clearance than did rinsing with water following manual brushing. A total of 8.2754 grams of debris were removed with "Rinse C" following brushing compared with 0.9018 grams of debris cleared with distilled water following brushing.

Study 3: The effect of dental floss on total oral debris clearance when combined with manual toothbrushing and oral rinsing with "Rinse C".

Twenty-five randomly selected subjects ate a standardized noon meal and then brushed with a manual toothbrush and followed with "Rinse C". This was succeeded by the use of dental floss and a second mouth rinse containing quaternary compounds and surfactants.

Brushing and rinsing removed a total of 17.02 grams of debris for the twenty-five subjects over a four-day period. Brushing and rinsing and dental flossing removed a total of 30.60 grams of debris. The use of floss resulted in an additional clearance of 13.58 grams of debris for the twenty-five subjects over a four-day period.

Study 4: The comparative efficacy of manual and automatic brushes used with dental floss and mouth rinse.

Twenty-four individuals who were highly sophisticated in the use of manual toothbrushes participated. No instructions were given in the use of the automatic toothbrush. Six subjects consumed a standardized lunch for four days. After eating they reported to the laboratory where 3 subjects brushed their teeth for 60 seconds with a manual brush and the other 3 brushed with an automatic brush. Following brushing, each subject rinsed for 60 seconds with "Rinse C", then used dental floss and again rinsed for 60 seconds. The second week the same procedure was followed except that the 3 who had used the automatic brush now used the manual brush and vice versa. This procedure was repeated for 8 weeks so that a total of 48 before and 48 after dental floss usage values were obtained on the twenty-four subjects.

The use of an automatic toothbrush without proper indoctrination offers little additional cleansing power over use of a standard manual brush if one is sufficiently sophisticated in its use. However, use of dental floss following toothbrushing with either a manual or an automatic brush greatly aids the removal of oral debris.

From the results of seven studies, four of which are reported in this abstract, it would appear that even simple rinsing with water for 60 seconds offers a sizeable amount of oral debris clearance. However, the best total routine for oral debris clearance used in this study appears to be (1) brush (2) use dental floss and (3) use an antiseptic mouth rinse containing quaternary compounds and surfactants.

(Abstracted by: CAPT P. F. Fedi, DC USN.)

PERSONNEL AND PROFESSIONAL NOTES

MULTI-SYRINGE IMPROVEMENTS

The Dental Division has been advised by Ritter Equipment Company, Rochester, New York, that the design of the Multi-Syringe hose assembly has been modified, whereby the water tubing is brought completely through the hose and connected directly to the water supply pipe. This change eliminates the junction of both air and water in the Multi-Syringe hose connection block thus eliminating the possibility of water mixing with the air at this point. Also, the design of the Multi-Syringe nozzle has been modified, whereby the water tube has been brought out through the opening in the nozzle, which will alleviate the possibility of back siphonage of water into the air passage of the nozzle. For maximum benefit from these changes, the manufacturer recommends that the nozzle be installed when making the initial installation of the modified hose. The manufacturer requests that replacement syringes or hoses be ordered according to the part number and description listed below:

New Part Number	Approx. GSA Price	Description	Replaces Old Part No.
137431	$17.00	Hose Assem. for Modulaire	135999
137432	76.70	Syringe Complete for Modulaire	135620
137433	17.00	Hose Assem. for Console	137161
137434	76.70	Syringe Complete for Console	137160
137437	17.00	Hose Assem. for Assistant's Console	135999
137438	76.70	Syringe Complete for Assistant's Console	135620
137353	5.55	Nozzle	135618

DENTAL HEALTH SURVEY

The previous issue of the U.S. Navy Medical News Letter cited a dental health survey of 1,000 naval personnel upon release from active service. The table below gives the dental classification of 2,174 Marine Corps personnel on duty in Vietnam following another dental health survey. Significant differences exist in Classifications I, II, and III, upon comparing the two surveys: The two groups represent personnel with wide variations in active service. Those being released from service have had four or more years of active duty. Those in Vietnam, on the average, probably have had less than 2 years service. The logical assumption is that the difference between the two groups may be attributed to the dedicated accomplishments of those serving in the Naval Dental Corps.

Classification	Number of Marines Classified	Average Number of Mos. In-Country
I	383–17.6%	5.9
II	1132–52.2%	5.9
III	558–25.6%	5.4
IV	94– 4.3%	4.8
V	7– .3%	6.5

AMERICAN DENTAL ASSOCIATION RESTATES POLICY ON X-RAYS

In consideration of recent misleading news items concerning the use of dental roentgenograms, the American Dental Association has emphatically *restated* and clarified its policy. "The policy states, in part, that X-rays, like medication or anesthetics, should be used according to the individual needs of the patient and the indicated treatment procedure."

"The Association has long advised practitioners that the use of x-radiation should be kept at a minimum and should only come after careful consideration of both the dental and general health needs of the patient."

"The number of exposures should be the minimum necessary to obtain essential diagnostic information."

In order to insure maximum distribution of the position of the American Dental Association in this regard, the following recommendations are reprinted as listed in JADA 76:2 of February 1968:

1. Radiographic examinations should not be made periodically or be a standard part of every dental examination and should only be used if the information to be obtained will contribute to proper diagnosis and prevention of disease.

2. Use the fastest speed film available. Request film of a USASI (USA) Speed Group rating of "D" or faster.

3. Use only a collimated X-ray machine so that the X-ray beam striking the skin is not more than 2.75 inches in diameter. Further restriction of the beam can be obtained by rectangular collimation. If cone cutting occurs, practice proper aligning.

4. Make sure your X-ray machine contains filtration of 2 mm. of aluminum equivalent if operating at less than 70 kvp. and 2.5 mm. of aluminum equivalent, if operating at 70 kvp. or above.

5. Use shielded open-end cones to reduce scatter radiation.

6. Use leaded aprons on children and all patients in the reproductive age range as a further precaution to prevent radiation of the gonads.

7. Use film holders, bite tabs or other means to position film during exposure. The dentist or assistant should never hold a film in place for a patient.

8. Have periodic radiation protection surveys made of your office.

9. Properly expose the X-ray film. Overexposure with underdevelopment subjects the patient and office personnel to unnecessary radiation.

10. Follow manufacturer's instructions for processing X-ray film.

11. Continue your education in the area of radiology as well as other areas of dental practice.

NURSE CORPS SECTION

YOKOSUKA CONDUCTS SEMINAR FOR HOSPITAL CORPSMEN

Recently the Fleet Surgeon, U.S. Pacific Fleet indicated the need for providing Hospital Corpsmen assigned to duty in Southeast Asia with additional experience and education in many clinical nursing, laboratory, and other medical skills. A suggested list of subjects for inservice education programs for Hospital Corpsmen was prepared and forwarded to all Chiefs of Nursing Service by the Nursing Division, Bureau of Medicine and Surgery in October 1967.

In conjunction with this the Commanding Officer and the Chief, Nursing Service at Naval Hospital, Yokosuka planned and implemented a seminar for a group of Hospital Corpsmen on the staff who were in receipt of transfer orders to Vietnam. An outline of the course is presented in this issue.

The Professional Skills Required of a Hospital Corpsman for Partnership in a Combat Area Medical-Surgical Team

9 January 1968 — Conference Room

Moderator — CDR T. Butler, NC USN

0815 Welcome — CAPT A.B. Errion, MC USN

0820 Orientation to Duty in Vietnam — CDR A.C. Wilson, MC USN

- A. Principles of evacuation of patients
- B. Casualty sorting (priority care)
- C. Distinction between medical versus tactical decisions
- D. Safety precautions under fire

0920 First Aid Treatment of Marines in the Field — CDR R.G. Hauser, MC USN

- A. Shock
- B. Hemorrhage
- C. Proper application of an arterial tourniquet
- D. Sterile dressing techniques
- E. Poisonous snake bite
- F. Discriminating when helicopter evacuation should be authorized (serious versus non-serious injuries)

1020 Cardiac Arrest — LT W.H. Shider, MC USN

- A. First Aid
- B. Care and maintenance of an airway during evacuation
- C. Oral airway, face mask, ambu type self inflation bag

Moderator — CDR W. Copeland, NC USNR

1300 First Aid — CDR R.E. Tobey, MC USN

- A. Intravenous technique (intracaths and Angiocaths)
- B. Aseptic techniques for injection
  1. Intravenous
  2. Intramuscular
  3. Subcutaneous
  4. Intradermal
- C. Use of serum albumin

1345 First Aid for Burns — CDR M.A. Vasquez, MC USN

A. Burn Dressing

1415 First Aid for Fractures
LCDR R.J. Bailey, MC USN

A. Performing a physical examination
B. Transportation of the injured
C. General instructions for injuries of
1. Skull
2. Spine
3. Pelvic
D. Splints
1. Arm
2. Leg

10 January 1968 Conference Room

Moderator CDR T. Butler, NC USN

0815 Patient Care CDR W. Copeland, NC USNR
A. Nursing care on the ward

0845 Intensive Patient Care
LTJG J. Mann, NC USNR

A. Intensive care unit nursing care
B. Intensive and post-operative care
C. Intake and Output records

0915 Maintenance of medical records and Navy service records
LT R. K. Zentmyer, MSC USN

0945 Sanitation Responsibilities
LTJG J.R. Blanton, MSC USN

A. Field sanitary measures; teaching non-medical comrades hand washing
B. Preventive medical measures
C. Enforcement of sanitary regulations
D. Rhodent control

1015 Basic Laboratory Procedures
LT K.R. Barr, MSC USN

A. Urine
B. Blood
C. Preparation of malaria smears
D. Stool specimen collection without contamination

1100 Red Cross Review M. Bennett, ARC

Moderator CDR W. Copeland, NC USN

1300 Bladder Injuries
CDR G. A. LeBlanc, MC USN

A. Recognition of injury to the urinary bladder
B. Catheterization techniques

1345 Dermatologic Problems
LCDR J. Levy, MC USN

A. Identification of skin infections
B. Prevention of skin infections

1430 Intermission

1500 I & E Classroom

1505 Care of Traumatic Chest Wounds
CDR R.L. Brisbin, MC USN

A. First Aid
B. Technique and indication for tracheostomy
C. Care of chest tubes

RESERVE SECTION

ANNUAL QUALIFICATIONS QUESTIONNAIRE

In August or September Naval Reservists throughout the nation receive a letter from the Naval Reserve Manpower Center, Bainbridge, Maryland containing the Annual Qualifications Questionnaire—Inactive. This form NAVPERS 319 (Rev. 6–65) is to be filled out and returned promptly. Why must it be completed and what purpose does it serve? One might liken it to applying for a credit card. The information on your application enables the firm or organization to determine your status of solvency. In this case, it helps establish your achievements and status in the Naval Reserve and if this is "solvent" your "credit card" is in the form of being permitted to continue active participation in the Naval Reserve and also a mobilization billet. Perhaps it would be most appropriate to repeat the important instructions on the reverse side of the worksheet as to the purpose of the Annual Qualifications Questionnaire.

"*Purpose.* Accurate and complete preparation of the Annual Qualifications Questionnaire by each reserve officer is important both to the officer and to the Navy. This questionnaire serves several purposes:

"a. It provides current information to the Naval Reserve Manpower Center on your experience, education, and skills in determining mobilization assignments.

"b. It provides information on your current achievements and activities to boards considering you for selection to the next higher grade and to disposition boards considering you for retention in or release from the Naval Reserve.

"c. It provides information required by the Armed Forces Reserve Act of 1952, as revised, codified, and enacted in Title 10, United States Code, affecting your priority of recall on mobilization and your present status in the Naval Reserve."

It is well to read the foregoing carefully and note the cogent reasons for executing the AQQ properly. All too often an officer does not indicate that he has continued his post-graduate education and has become board certified in his specialty or has become qualified in a sub-specialty. Likewise an officer may not think that being appointed to the school board or being made an advisor to the local government or some civic activity should be noted down. Quite to the contrary, it is important to note such things for it not only helps the Naval Reserve Manpower Center but also the members of the selection board when one is being considered for selection to the next higher grade. It should be noted at this point that it is not necessary to submit a complete curriculum vitae each year. Your cumulative Annual Qualifications Questionnaires are your curriculum vitae providing they have been properly executed.

It is well to remember that failure to submit an AQQ can be one of the reasons for non-selection. Your AQQ's are looked at carefully by convened boards.

Therefore it behooves an officer to make sure that all questions are answered correctly and fully.

OCCUPATIONAL MEDICINE SECTION

HEADACHE—AN INDUSTRIAL NEMESIS

Seymour Diamond, MD, Bernard J. Baltes, MD PhD, Industr Med Surg 36(9):585–587, September 1967.

Headache is one of the most common excuses used by employees for either not coming to work or, once there, asking to be relieved from their duties.

Both factors have the same results: decreased efficiency. Much work loss can be prevented if the industrial physician is able to differentiate between headaches due to industrial causes, those of emotional etiology, and—of great importance—the malingerer's headache. Just as important, of course, is the treatment for each of these categories.

To define headache simply as pain arising from various structures within the skull is meaningless. The head contains the controlling mechanisms for many of the somatic functions. More important is its relationship to centers controlling emotions and the psyche. In man, this puts special emphasis on the aches and pains associated with this area. They may even be referred to as painful sensations, which can further complicate the understanding of their cause.

Attempts have been made to classify headaches; one of the best is the classification made by the American Association for the Study of Headache (Table 1). The problem arises as to how to fit headaches seen in industry into this classification.

Headaches arising from industrial conditions must first be recognized, since if the causative agent can be removed or the condition corrected, the headache will subside.

Chemical Agents

Many agents, especially those associated with vascular dilatation or constriction, account for severe headaches. If the pain is caused by nitrates or nitrites, a dull, throbbing, generalized aching is characteristic. Carbon dioxide may produce headaches as a result of hypoxemia. Acetanilid, alcohol, carbon tetrachloride, benzene, arsenic, lead, insecticides, all produce headaches as a common toxic symptom. Removal of these contaminants in the circulating air will correct the discomfort produced.

TABLE I
Classification of Headaches

Vascular Headache	Muscle Contraction Headache	Traction and Inflammatory Headache
A. Migraine 1. Classic 2. Hemiplegic 3. Ophthalmoplegic	A. Cervical osteoarthritis	A. Mass lesions (tumors, edema, hemotoma, etc.)
B. Cluster (histamine)	B. Chronic myositis	B. Disease of the eye, ear, nose, throat, teeth
C. Toxic	C. Depressive equivalents and conversion reactions	C. Cranial neuralgia
		D. Allergy
		E. Infection
		F. Arteritis, phlebitis

Noxious Stimuli

These stimuli may primarily affect the sensory organs—nose, ears, or vestibular apparatus. Odors that are nauseating, pungent, or acrid often produce headaches. Sounds—high-decibel, shrill, sharp, staccato, or heavy poundings—can initiate severe head pain.

Employees servicing jet aircraft often are victims of headaches due to the excessive noise and vibration. The noise can be so intense that it may produce deafness, tinnitis, and severe pain.

Drugs

Individuals under treatment for many diseases may directly or indirectly be subjected to headaches. Any medication affecting the vascular tree, either through vasodilation or vasoconstriction, is capable of inducing headaches. Most offenders are the drugs used for the treatment of hypertension.

Drugs which cause hypoxemia, hypoglycemia, or alter water and electrolyte metabolism may be special offenders. Correction and adjustment of the medication can control these symptoms.

Hypoglycemia produced by dieting, or simply by missing a regular meal, may produce cerebral discomfort.

Although caffeine, per se, is not usually a causative agent, the withdrawal of this drug can produce headaches. This reflects one of the real advantages of the "coffee break".

A large number of modern medicaments cause headache as a side-effect, often accompanied by dizziness and light-headedness.

Psychophysiologic Factors

It is difficult to determine whether a worker is suffering from psychogenic headache or is simply malingering, since most malingerers also suffer from a severe personality disorder. Therefore, extreme caution must be exercised by the physician before calling a patient a malingerer or implying that the patient is consciously promoting his symptoms. If the patient learns that the physician implies malingering, the patient will feel rejected and all therapeutic rapport between the physician and the patient is lost.

Headache from so-called accident neurosis, following industrial accidents where a problem of compensation or settlement is involved, is often severe and prolonged, especially when the working conditions have become rapidly intolerable to the employee. The fact that there may be both monetary gain from the injury and escape from distasteful employment tends to potentiate the situation. In such cases, the physician should try to minimize the severity of the situation, since even the most minimal reference can exaggerate the neurosis.

However, in cases of accident neurosis the symptoms do not always entirely disappear once the patient has been compensated. A detached attitude by the physician with relation to the monetary and legal aspects of the case will permit him to be of greater help to the patient.

A large number of poorly defined headaches are due to emotional problems. So often the problems of life are not due to an individual's inner conflicts but to the defenses he sets up against them. Problems of family relationships, friendships, and marriage are unavoidable; here the industrial physician can do much toward treating headaches from these causes by simply listening patiently to the problems and lending sympathetic psychologic support.

Discussion of the psychiatric aspects of headache must include consideration of the psychiatric aspect of pain in general. Since the head serves as the seat of thinking; for the primary sensory reception of hearing, sight, and smell; and for the output of movement, speech, and emotional expression, it becomes one of the choice sites of psychogenic pain.

The person with frequent headache without organic causes is utilizing body language to express his personal and interpersonal conflicts. The industrial physician can render one of the most dramatic forms of relief by his interest and concern. He must allow the patient time to air his long stories of resentments and frustrations.

Depressive headaches occur at regular intervals in relation to daily life, especially on weekends, Sundays, holidays, and on the first days of vacations or after examinations. The symptoms are capricious, bizarre, and follow no definite pattern, as to location, although the occipital portion of the skull is most often affected. A depressive headache is usually dull and generalized, characteristically worse in the morning than in the evening. The diurnal variation is the most useful diagnostic characteristic of the headache and suggests severe depression when other features are inconclusive. The fact that such headaches do not respond to the usual analgesics helps in the diagnosis.

When a patient complains of a continuous headache, especially headaches which awaken him in the morning, one should be suspicious of depression. The diagnosis of depressive headaches is made by the correlation of physical, emotional, and psychic symptoms.

Antidepressants such as amitriptyline have been useful in depressive headache. In a recent double-blind study comparing amitriptyline, amitriptyline combined with perphenazine, and placebo, relief of the various target symptoms, of which headache was one, was used as the criterion.

Headache was significantly relieved by these agents as compared with the placebo.

PNEUMATIC RUPTURE OF THE COLON AS AN INDUSTRIAL INJURY

Gustav L. Zechel, MD, Industr Med Surg 36(10):663–667, October 1967.

Few injuries can create a situation in which a life can so easily be lost by procrastination or so rapidly saved by prompt and proper action as compressed-air injuries to the colon. Yet because of the relative infrequency of such injuries and the comparatively rare inclusion of this entity in medical curricula, many physicians are not prepared either to recognize or to cope with it.

The complex of symptoms and physical findings is puzzling even to the seasoned diagnostician facing for the first time a patient with this injury, as no external signs of trauma are visible. Yet the life of the victim is endangered unless the injury is recognized and the lacerated or ruptured colon repaired within 6 to 8 hours after injury, before fecal matter has had time to set up a fatal peritonitis.

Pneumatic rupture of the colon most often results from a prankish application of the nozzle of a high-pressure air hose to the rectum of a workman who is standing or bending over; rarely the accident may occur to a man who is dusting his clothing with a current of compressed air, usually just before leaving work. The injured man experiences a sudden severe pain in the abdomen, collapses with a scream or a moan, and is rarely able to stand upright. The seriousness of the injury is quickly recognized by the surprised bystanders, who generally rush the victim to a hospital. A few cases are on record in which the patient was first taken home and then, some days later in a hopelessly moribund condition, transferred to a hospital. However, in recent years the public has become more hospital conscious with regard to injuries of all types.

The original article presents a case history of pneumatic rupture of the colon resulting from a prank. The case was treated successfully by surgery.

Discussion

Compressed air was first used in industry about 1900; the first compressed-air injury to the colon was reported by Stone in 1904. Civilian surgeons observe such injuries rarely; case reports are generally an individual variation of the same chain of events and findings. Hence only the composite experience of many authors provides adequate data for a complete evaluation of this condition. Since,

in all probability, not every such injury receives literary documentation, the incidence is undoubtedly higher than that reflected in existing literature.

In the prankish injury, which unexpectedly turns into tragedy, the nozzle is pointed toward the anus of the victim—especially one whose bending posture seems to invite such "goosing". Even at this distance, the highly compressed air (50 to 150 lb./sq. in.) penetrates the clothing and easily overcomes the resistance of the sphincter ani, the nares serving as a funnel to the anus. Various authors present data showing bursting pressures for human intestine of 1½ to 8 lbs./sq. in. of air pressure.

The extent of injury is determined not only by the force of the compressed air but also by the amount entering the gut and the peritoneal cavity. At the moment of the event, force is the predominant factor; after the entry of the air, the patient's condition depends on the extent to which the abdomen is distended. Another factor is the length and curvature of the sigmoid. When the victim has a short sigmoid which forms just a slight bend between rectum and descending colon, without any convolution, the air stream is gently deflected through the almost straight tube formed by these parts. In such structures, the air must progress to the splenic flexure to meet an intestinal wall squarely and cause either complete or partial laceration. When the sigmoid is long and a convolution exists between rectum and descending colon, the air stream squarely hits the wall of the sigmoid convolution and produces a rent at this point.

One is tempted to assume that, when the "straight-line" colonic condition is involved, the diffusely expanding air produces a ballooning of the mucosa through a rent in the muscularis and serosa, while in the "direct hit", a hole is torn through all the layers of the colon. For these reasons, case records of compressed-air injuries would be more illuminating if all anatomic features were described.

Pathology

Within a second after entry of the compressed air, two distinct events occur: (1) the direct impact of the head of the rushing jet stream against the inner surface of the gut; and (2) the diffusion of the air through the rent in the colon and into the peritoneal cavity, causing a great distention of the abdomen.

In the first event, most of the damage is generally found at the natural curvatures of the colon; the rectosigmoid junction, the sigmoid, or the splenic and hepatic flexures. The force of the contact is as great as though a rigid rod has been introduced.

Areas of the colon remote from the direct ramrod action of the jet stream may also show multiple lacerations as a result of the diffusely spreading air pressure within the lumen of the colon. The air, which then bursts or seeps through the rented or lacerated gut, distends the abdominal wall and forces the diaphragm upward. Air may also work its way into the retroperitoneal space and invade the perirenal area, where it can be seen on x-ray. Air has even been reported to invade the gallbladder.

With the passage of fecal matter into the abdominal cavity and the resultant peritonitis, the injured colon becomes spastic, contracted, and nearly entirely empty.

The upward displacement of the diaphragm diminishes thoracic space, restricting respiratory excursions of the thorax, embarrassing cardiac action, and deranging circulation; these conditions contribute to the resulting shock. When the inefficiency of these vital functions is forced to an extreme, the patient may succumb within minutes after injury.

In contrast to other trauma to the colon, as in gunshot wounds or crushing injuries, the blood supply in compressed-air injuries remains intact. Multiple subserous hemorrhages in areas extending far from the laceration are occasionally found. The ascending or descending colon may be torn loose from the dorsal abdominal wall, but even in this event the blood supply to this area is rarely disturbed. The rectum itself shows no pathology because it is well supported by surrounding structures and because the air stream passing through in a straight line exerts little side pressure.

Diagnosis

When a truthful history of the cause of the accident is reported, either by the patient or by a companion, the surgeon can assume the nature of the trauma before examining the patient. When the cause is concealed, for the protection of the guilty person, the surgeon faces a diagnostic enigma and may easily arrive at an erroneous diagnosis.

On admission, the patient appears pitifully helpless, "doubled over," in frantic anxiety if not in shock, and in great pain, usually expressed by frequent moaning. His face is pinched and anxious and his skin cyanotic, moist, and cold. If he is able to respond to questions, he complains of a sense of fullness in his abdomen, accompanied by pain in both the abdomen and rectum, with a feeling that he wishes to move his bowels but without avail. He

may report nausea, but he rarely vomits or belches. Occasionally pain in the region of the shoulder—a referred pain from the stretched diaphragm—may be complained of.

On examination, the abdomen is found greatly distended, tympanic on percussion over its entire surface, and hard on palpation. The skin over the abdomen is stretched and the entire abdominal wall seems to be thinned. No dullness is elicited over the liver. Tachycardia is always present, with a weak and fading pulse.

The absence of rectal bleeding in respect to the gravity of the injury is remarkable. On proctoscopy —a procedure which should be discouraged—no blood is usually found in the rectum except perhaps a drop or streak from a laceration. The mucosa itself is strongly hyperemic. The roentgen examination demonstrates only free air in the peritoneal cavity without contributing further to the specification of the diagnosis. Because the air escapes from the lacerated colon into the peritoneal cavity, the colon is collapsed or contains only very little of the air in contrast to a colon broadly distended by obstruction. The roentgen examination may also provide contributory information of incidental changes in the heart or lungs.

Routine laboratory examination of the blood and the urine may give valuable warning of coexisting blood dyscrasia, diabetes, or kidney disease, but fails to clarify the differentiation of the diagnosis, which rests first of all on the typical history and secondly—only to a limited degree—on the physical examination. Laboratory and x-ray examination have more academic than practical significance in this injury, since the diagnosis is established before their use and immediate surgery must be resorted to if a fair chance of recovery is to be given to the patient without losing any time.

Use of rectal tubes, enemas, and proctoscopy in compressed-air injuries not only do not help in diagnosis or therapy but may greatly exacerbate the condition. A rectal tube cannot afford relief, since the air is not in the colon but in the peritoneal cavity, and the free air cannot return into the empty and deflated colon because the pressure in the peritoneal cavity compresses the collapsed gut from the outside. Thus the rent in the colon wall functions as a one-way valve, allowing the passage of the high-pressure air from the colon into the peritoneal cavity but not in the reverse direction. For these reasons the use of peristalsis-stimulating drugs is senseless.

Nor is morphine of value, since it will not alleviate the pain in such a condition and it further depresses an already embarrassed respiratory system.

Therapy Procedure

As the result of the mechanism of the injury and the sequence of events, three distinct clinical entities must be differentiated in the examination of the patient; each must be properly evaluated for the therapeutic procedure to be taken: First is the initial shock caused by the tear in the bowel and the forceful entry of the air into the peritoneal cavity; second, the circulatory and respiratory embarrassment caused by the high position of the diaphragm and restricted intrathoracic space; third, the peritonitis caused by the contamination of the peritoneum with fecal matter.

Thus two types of shock are involved: the primary shock, caused by the impact of the compressed air and resultant trauma to the colon, and the secondary shock which follows by the upward displacement of the diaphragm. The primary shock has usually worn off by the time the patient reaches the hospital: however, the surgeon, not realizing this, may lose time applying shock treatment which must remain ineffective so long as the causes of the secondary shock—the distended abdomen and displaced diaphragm—are uncorrected.

Secondary shock can be relieved only by paracentesis of the peritoneal cavity, with a hollow needle or a small trocar. The noise of the escaping air is a most dependable confirmation of the diagnosis. A moribund appearance of the patient should not deter the surgeon from immediate action, since the patient's condition will generally improve rapidly as soon as the pressure is relieved; thoracic space will be increased, respiration becomes deep and less rapid, cyanosis is replaced by a better color, the pulse rate drops and the pulse strengthens, the blood pressure improves, and the patient feels greatly relieved.

As soon as the secondary shock symptoms disappear, the patient is ready for the third step, the surgical repair of his colon and prevention of fatal peritonitis.

The operation has two aims: first, to remove all fecal matter from the peritoneal cavity, and second, to repair all defects in the colon.

All lacerations of the colon should be sutured: the penetrating laceration by two rows of interrupted sutures; lacerations of serosa and muscularis with protruding intact mucosa also can be closed by a simple row of interrupted sutures. Only rarely does it become necessary to resect a devitalized seg-

ment of the colon because of too much damage to the colon wall either by multiple and crowded lacerations or gangrenous areas.

To prevent the occurrence of pneumatic rupture of the colon, practical jokes should be discouraged by posters warning employees not to make improper use of compressed air. The public should know that compressed air can become a deadly weapon.

THE "KICK" HANG-UP

Nat Clearinghouse Poison Contr Cent Bull, HEW, PHS, Nov–Dec 1967.

In 1962, the January-February issue of the National Clearinghouse Bulletin was devoted to the subject of "Glue-Sniffing". At that time, the practice was first beginning to attract public and medical attention. Although glue was emblematic of the practice of solvent inhalation, other solvents like gasoline, fingernail polish removers, and spot removers were also implicated. There were several deaths associated with this practice due to the use of plastic bags. Most public authorities considered it a fad, yet they took appropriate measures to curb the practice and warn the misusers of the dangers.

However, "glue-sniffing" heralded a new era of experimentation with a wide variety of chemicals and concoctions. Since that time, there has also been increased publicity, and probably use, of psychotomimetics. Compounds like marijuana and heroin have become so familiar, that they are recognized by their nicknames "pot" or "H". It seems that lysergic acid diethylamide never had a formal introduction and joined the society as LSD; and the halluncinogen methyl dimethoxy methyl phenylethylamine is more commonly known as STP. And new problems were generated for the medical authorities and poison control centers. For although the phenothiazines have shown some effectiveness in treating LSD patients, its use of STP symptoms is reported to be contraindicated.

The psychotomimetics of plant origin such as peyote, which are more frequently encountered in pharmacology tests and magazine expositions of the religious rites of the Central American Indians, have not proven to be a problem to the physicians in the poison control centers. However, they have heard of the more available substitute, "Morning Glory Seeds," which, in addition to being moderately hallucinogenic, are capable of producing a psychosis similar to that sometimes brought on by LSD. In Maryland, five youths sought medical attention after ingesting Jimson Weed which is commonly accepted as a poisonous plant. This plant, whose origins and name came from the colonial settlement in Jamestown, Virginia contains atropine and scopolamine, which can produce hallucinations. Marijuana grows wild in some parts of the United States and has been cultivated in others.

Medicines, such as the barbiturates and amphetamines, have had much notoriety and the treatment of their intoxications has been well covered in the medical literature. The treatment of the amphetamine intoxications with the phenothiazine derivatives is probably the most recent innovation. However, other medicines have been added to the list. The antihistamines commonly used for antivertigo and antiemetic purposes, have also produced calls to the poison control centers because of their apparent misuse to produce hallucinations. The use of medications to produce toxic or adverse effects seems a particularly dangerous experiment. One 17-year-old was admitted to the hospital 24 hours after chewing on the wick of a nasal inhaler containing a sympathomimetic amine and was described as hallucinating, hyperactive, and twitching. One poison control center has received several calls on a powder of solanaceous herbs containing the active ingredients, atropine and scopolamine, that have been used for the purpose of getting "high". The powder is normally used by igniting it and inhaling the vapors for the relief of asthma.

Even banana peels, after a more ritualistic than scientific preparation, have been smoked in order to induce hallucinations. Animal tests have subsequently confirmed that there are no psychotomimetic effects. Fortunately, although this effect was not obtained, there have been no cases reported where it has caused harm. Not so with the cocktail glass chillers. Six deaths have already been reported from the freons in these preparations. The cause of death is not clear, but may be from freezing damage to the lung tissue, laryngeal spasm or possibly anoxia because of the displacement of air.

Thus, the problems with the hallucinogenic drugs has been compounded by the use of non-hallucinogenic materials that may produce toxic if not lethal effects.

EDITOR'S SECTION

THE RIGHTS OF PATIENTS

Robert E. Chiles, Ph.D., New York City, New Eng J Med 277(8):409–411, Aug. 24, 1967. "Reproduced with the permission of The New England Journal of Medicine."*

Basic medical services are the right of every citizen. The recently enacted Medicare and Medicaid programs now guarantee competent care and adequate facilities to previously neglected segments of American society. These programs are understandably silent, however, about some essential human rights that are infrequently recognized and respected. Indeed, these important rights are often violated, not only by family and friends but also by many in the medical profession.

Four such rights that are essential to the human spirit need some defense: the rights to privacy, pain and truth, and the right to die. The legitimacy of these rights may be questioned. Do they derive their authority from church, state or conscience? It is sufficient for this discussion if they are intuitively accepted as basic needs of human nature. If only external mandate or moral obligation underlies their recognition, the indispensable ingredients of sensitivity and empathy may well be lacking in their support.

The Right to Privacy

When the body is ailing it must be subjected to impersonal examination. It must be tapped and tested, exposed and manipulated. Only rarely in such circumstances can a person detach his feelings from his body. When the invasion of bodily privacy is necessary to his cure, however, he can brace himself to endure it.

Harder to take and easier to avoid is the invasion of psychic privacy. There seems to be an unwritten law that allows every passer-by to inquire about the condition of anyone who is sick. ("And how are you feeling today?") In hospitals this question begins at the crack of dawn and continues throughout the long day. It is asked by doctors and nurses, cleaners and clergymen, family and friends and anyone else who wanders past.

There will be times, of course, when such attention is welcome. But there will be many more when the patient desires only to be left alone. The last thing he wants is casual persons intruding into his suffering particularly if they do not genuinely care how he feels or if they can't help even by being sympathetically understanding.

The patient's inner tranquility is a frail reed at best. It is not strengthened by the periodic invasion of the medical specialist, a flock of interns in his wake, who conducts classes on his hapless victim interspersing guttural diagnosis with equally incomprehensible polysyllabic description. Nor is it reinforced by the resident who barges in without identifying himself, takes a sample and departs without a meaningful word about his visit.

Since the patient finds it hard to surrender the privacy of his person, he needs even more to maintain the privacy of his psyche. Too often it gets less respect than his body.

The Right to Pain

Many a patient is forced to conclude that he is not really supposed to feel pain. At least he is not to acknowledge it if he does. Though he will be asked many times how he feels, he soon discovers that the expected answer is "better" or "fine." Actually, his inquirers want to be reassured that he is doing well so that they need not take his pain seriously. Ironically enough, they expect the patient to show them consideration.

Therefore, he should never say, "I feel miserable." Such a thoughtless response occasionally is ignored. Frequently, it prompts cheery words of encouragement. Too often it triggers dreary lectures on how much worse things might be. Still the stubborn fact persists: the patient feels terrible.

But the repression of feeling is a form of dishonesty, and dishonesty is consistently harmful not only to those who use it but also to those who accept and support it. Yet in hospitals and out, patients are regularly required to suppress the truth and tell their daily lies. Perhaps they are forced to do so because their interrogators cannot face suffering themselves. Perhaps those who care for them are so surrounded by pain that they risk emotional inundation if they expose themselves too much. Whatever their reasons, they succeed in depriving the patient of his right to pain.

But the patient needs to have his pain. It serves important purposes. It is both a warning and a plea.

* Assistant dean, School of General Studies, Hunter College of the City University of New York (requests for reprints should be addressed to Dr. Chiles at 695 Park Avenue, New York, New York 10021).

It must be recognized for the sake of emotional as well as bodily health. It asks others to accept it and to take it seriously. For in doing so, they provide the patient with invaluable support.

Of course, claiming the right to pain has its dangers. Perhaps the patient is a hypochondriac and will cling to his suffering in frustrating and self-defeating ways, or he uses it to manipulate others or to get even with them for real or imagined wrongs. But the misuse of this right does not prove it invalid, or excuse those who care for the sick from attempting to meet each patient's particular needs. To be expected to deny pain is not good for the patient or for his pain.

The Right to Truth

Hospital veterans may agree on the importance of their rights to pain and privacy. A large number of them are less enthusiastic about the right to truth.

Many patients find the truth about their illness severely threatening and will go to great lengths to avoid or suppress it. They prefer comforting falsehood to threatening fact. And the preference is understandable. In such cases, wisdom requires that others play their game. But these patients are not the ones whose right to truth is compromised. They simply do not want it.

Other patients and their families are convinced that in the long run nothing is gained by avoiding the truth. They prefer to learn the hard facts at once and gain the time and support necessary to accept them.

Unfortunately, many in the medical profession seem to work on a different basis. Characteristically, they defer or refuse to speak the unsettling truth. And, by so doing, they deny a patient the opportunity of coming to terms with his prospects. In some cases their refusal even deters the process of recovery.

Varying factors may underlie the doctor's indecision or deception: his personal fear of death; his uneasiness about dealing with the patient's aroused anxiety; his mistaken estimate of what is best for the patient; or his apprehension about threats to his professional competence. Whatever the reasons, his silence is wrong. Ultimately, it is wrong because nearly every patient has some intuition about his real condition. At some level of awareness he senses the truth. If others deny this truth, he is driven into anxious exhausting conflict, caught between their denial and his own intuitive knowledge. Furthermore, he is forced to fight his battle alone. It will be all the more devastating as he adds to it his uninformed and terrifying fears.

Alarming truth should not be forced on reluctant patients who desire illusion instead. But the patient who wishes the truth has a right to it, and his physician has a duty to speak.

An important fact about the rights to pain and truth needs to be underscored. Denying the patient these rights out of supposed concern for his bodily health requires him to be dishonest with others and eventually with himself. It invites him to create a world of illusion, of psychologic sickness, that may become more disabling than his physical illness. The alarming fact is that after his body recovers, his soul may require a much more difficult cure. Supporting a fabric of falsehood is dangerous business, however well intentioned the reasons for it.

The Right to Die

For obvious reasons, the patient's final right—the right to die—is not a popular subject. It is too personal, threatening and irrevocable. It is not surprising that men are reluctant to claim it as a right, either for themselves or for others.

Pain and death are ever present and threatening enemies of mankind. One is reassured by continuing, miraculous efforts of the medical profession to ward off these twin invaders of human existence. Yet, in every case, the day comes when the doctor and the patient's family must surrender him to death. This surrender is not always nobly made.

Frenzied and compulsive efforts to avoid the obvious approach of death robs life of its remaining dignity. Families are often driven, by the threat of loneliness, their own fear of death or the guilt arising from their wish that the patient die, to insist that the doctor prolong his life at any cost. The professional doctor, however, should be sufficiently confident of himself and accepting of the fact of death to allow his patient to exercise his right to die.

In the face of imminent death, bottles and tubes, drugs and plasma, protracted agony and vegetable existence offer mixed commentary on medical skill and compassion. If the doctor does not want to struggle with human feeling and dignity, the easy way out is to turn to technology, to keep the glucose flowing.

But surely there are cases in which he should make a more difficult decision and allow his patient to submit to death. This is no argument for mercy killing. It is a plea only for the acceptance of an inescapable fact of existence—man dies.

Strangely enough, the dying are often more accepting of death than the living. And, when their inner being wills it, they should be allowed to move with dignity toward their final end. No human being who wants it should be deprived of this privilege.

The patient has valid rights to privacy, pain, truth and death. In the anxious, painful, fearful times when the human body is in travail, these rights of the human spirit need particularly to be respected.

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